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URBAN AIR SHED PHOTOCHEMICAL SIMULATION MODEL STUDY
VOLUME II. USER'S GUIDE AND DESCRIPTION OF
COMPUTER PROGRAMS

SYSTEMS APPLICATIONS, INCORPORATED

PREPARED FOR
ENVIRONMENTAL PROTECTION AGENCY

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**URBAN AIR SHED PHOTOCHEMICAL
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**VOLUME II - USES'S GUIDE AND DESCRIPTION
OF COMPUTER PROGRAMS**

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TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
I. SYSTEM OVERVIEW	3
II. DESCRIPTION OF THE PROGRAMS	10
A. The Emissions Data Preparation Program	10
1. Program Objective and Capabilities	10
2. Program Structure	11
3. Input Data Requirements	13
4. Program Output	14
B. The Meteorological Data Preparation Program	14
1. Program Objective and Capabilities	14
2. Program Structure	16
3. Input Data Requirements	17
4. Program Output	17
C. The Atmospheric Pollution Simulation Program	17
1. Program Objective and Capabilities	17
2. Program Structure	18
3. Input Data Requirements	28
4. Program Output	29
D. The Data Plotting Program	29
1. Program Objective and Capabilities	29
2. Program Structure	31
3. Input Data Requirements	38
4. Program Output	38
III. OPERATING PROCEDURES	39
A. General Information and Instructions	39
B. Program Operating Characteristics	40
1. The Emissions Data Preparation Program	40
2. The Meteorological Data Preparation Program	50

	<u>Page</u>
3. The Atmospheric Pollution Simulation Program	50
4. The Data Plotting Program	66
IV. LISTINGS, SYMBOL GLOSSARIES, AND SAMPLE OUTPUT . . .	71
A. The Emissions Data Preparation Program	72
1. Program Listing	72
2. Symbol Glossary	80
3. Sample Output	86
B. The Meteorological Data Preparation Program . .	90
1. Program Listing	90
2. Symbol Glossary	95
3. Sample Output	97
C. The Atmospheric Pollution Simulation Program .	100
1. Program Listing	100
2. Symbol Glossary	135
3. Sample Output	149
D. The Data Plotting Program	166
1. Program Listing	166
2. Symbol Glossary	179
3. Sample Output	185
REFERENCES	189

INTRODUCTION

The simulation model described in Volume I of this report is a dynamic model that was developed to predict ground level concentrations of inert and photochemically reactive atmospheric contaminants and their variations in space and time. Since the governing equations that comprise the model are coupled, nonlinear, second-order partial differential equations, a numerical, rather than analytical, solution is required. In addition, a comprehensive emissions and meteorological data base is needed to exercise the model. Clearly, a model of this computational complexity must be implemented on a digital computer. It is the purpose of the User's Guide to describe both the overall and specific operational characteristics of the computer programs which embody the model.

To realize the full utility of the model, the computer programs have been structured for general use, and not for exclusive application to a particular airshed. Thus, the inputs to the programs are parameters which specify the characteristics of the region to be modeled. For any specific application, minor modification of the codes may be required to account for individual airshed characteristics which are not treated in the general formulation of the model or codes. Since the simulation study of Los Angeles, reported in Volume I, is the first extensive application of the model, the codes included in this Guide reflect some of the characteristics which are unique to the Los Angeles airshed. In Section III, we discuss the alterations that we have made in the general codes in order to perform the present study.

As a part of this modeling effort, we have developed an airshed simulation package consisting of four computer programs. Three of the programs are subsidiary to the main program, which is used to predict ground level pollutant concentrations. We note that there are a large number and variety of inputs to an airshed model. As a result, we have written two specialized programs which perform specific tasks involving input data. One program carries out operations dealing with meteorological input data, while the other processes pollutant emissions inputs. The third subsidiary program prepares plots of the results predicted by the main airshed simulation program. We have found that structuring the system in this manner greatly simplifies its use.

The User's Guide is segmented into four sections. In Section I, we present an overview of the airshed simulation package. The main objective is to explain the basic computational structure of the package, indicating the function of all programs. To illustrate the manner in which a typical airshed simulation is performed, we describe the step-by-step application of each program, discussing required inputs, calculations performed, and use of the program output.

Section II is devoted to a detailed description of the individual programs, focusing on objectives, structure and capabilities. Since complete disclosures of all algorithms are included in Volume I of this report and in Roth et al. (1971), this discussion will deal only superficially with the technical content of the model. When appropriate, we refer the user to related sections in either or both of the reports cited for an expanded discussion of the topic.

from
The successful implementation of the airshed simulation package requires detailed knowledge of individual program operating procedures. In Section III, we present a complete set of instructions for the use of all programs. Computing system information is given, including program size, computing time, and hardware requirements. Since a large volume of data, provided as punched cards, is input to the programs, we have formulated a set of tables depicting the data-deck setup for every program. The tables include a detailed description of the input parameters, their units, and the format of each card.

Finally, listings of all programs are provided in Section IV. In addition, we have compiled for each program a symbol glossary describing important variables and their definitions. The glossary, in conjunction with the comments contained in the program, is intended for use as an aid in identifying the function of any particular section of the code. The symbol glossary is located immediately after the listing of the program. Following the glossary, we include several typical examples of program output.

In a practical sense, the computer codes may be viewed as FORTRAN representations of the algorithms and ideas presented in Volume I of this report and its earlier companion report. Thus, in order to fully appreciate the technical content of the programs, the user should be thoroughly familiar with Volume I and its Appendices, and with Roth et al. (1971) and its associated Appendices. Of course, anyone primarily interested in the technical aspects of the model will find the discussions in the reports cited of greater benefit and interest than the general descriptions included in the User's Guide.

For those who are interested in obtaining general information regarding the computational structure or capabilities of the programs, the discussions in Sections I and II of this Guide should prove sufficient. Individuals responsible for actually operating any or all of the programs should read the entire User's Guide, Sections II, III, and IV being of particular interest.

I. SYSTEM OVERVIEW

In this section, we describe the overall operating structure of the airshed simulation package. Before presenting this discussion, however, we briefly outline the major components of the model.

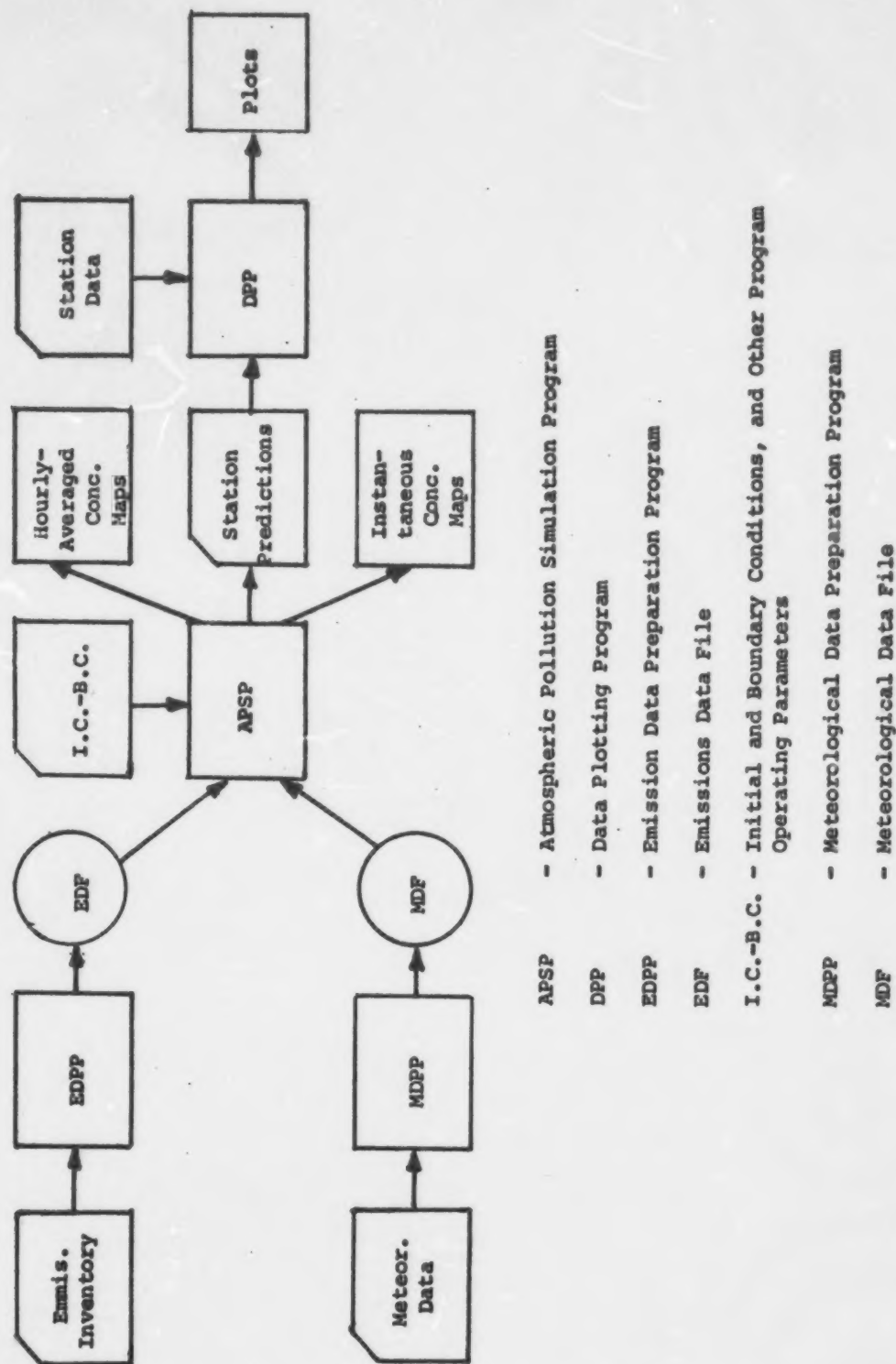
- a. Emissions. An emissions inventory must be prepared for all chemical species of interest. This involves calculating the total mass of pollutant emitted from automobiles, aircraft, and fixed sources into each ground level grid cell.
- b. Meteorology. Meteorological inputs of wind speed, wind direction, and mixing depth are specified at the center of all grid cells.
- c. Chemical kinetic mechanism. A chemical kinetic mechanism is required if any of the species of interest react in the atmosphere. The mechanism is used to determine the rate at which pollutant concentrations change due to chemical reaction.

The nonlinear, coupled partial differential equations expressing the conservation of mass of each pollutant comprise the governing equations of the model. Individual reaction rate expressions (from the kinetic mechanism) are incorporated into the equations, and emissions and meteorological data are inputs to the model. The solution is carried out by numerically integrating the governing equations on a three dimensional grid overlaying the modeling region to obtain the temporal variation of pollutant concentrations at each cell on the grid. The ground level grid layout used for the Los Angeles simulation study is shown in Figure 1.

The model developed in this study is embodied in four computer programs. The most important of these is the Atmospheric Pollution Simulation Program (APSP), which is used for predicting concentrations of air contaminants at the grid cells comprising the region to be modeled. We have also developed two specialized data preparation programs to process the large volume of emissions and meteorological input data. Digitized wind and mixing depth maps are input to the Meteorological Data Preparation Program (MDPP). This information is processed and placed in the Meteorological Data File (MDF). Emissions from automobiles, aircraft, and fixed sources are all combined in the Emissions Data Preparation Program (EDPP) to produce an array of total pollutant fluxes into each ground level grid cell. These fluxes are then placed in the Emissions Data File (EDF). The two data files serve as the primary mechanism for input of meteorological and source data to the APSP.

Validation of the model involves comparison of simulated concentration predictions with actual field measurements. As an aid in making these comparisons, we developed a Data Plotting Program (DPP). This program is used to prepare plots of both predicted and measured concentrations as a function of time. A Calcomp Plotter is employed to produce the plots, although any other plotter may be substituted after making the appropriate software alterations.

FIGURE 2
SYSTEM FLOW DIAGRAM



In Figure 2, we summarize the overall structure of the airshed simulation package, indicating the flow of information to and from each program. To operate the system, wind and mixing depth maps are prepared and transferred to punched cards. This information is input to the MDPP, which is used to create the MDF. Next, a complete emissions inventory is assembled. Once this inventory is digitized, the EDF is established by the EDPF.

After the two input data files are created, initial and boundary conditions are determined and placed on punched cards. In addition, operating parameters for the APSP are also specified on punched cards and included in the data-deck with the initial and boundary conditions. The APSP is then used to perform the airshed simulation. Pollutant concentrations are predicted at each grid cell, and using these values, an estimate is obtained for the predicted contaminant level at each air quality monitoring station. The results of the simulation are presented in three forms:

- 1) "instantaneous"* ground level concentration maps for all species printed at regular time intervals, such as once an hour - see Figure 3.
- 2) printed hourly-averaged ground level concentration maps for all species - see Figure 4.
- 3) punched cards containing hourly-averaged pollutant concentrations predicted at each air quality monitoring station.

The punched cards from the APSP, along with cards containing the actual pollutant concentrations measured at the stations, serve as the input data to the DPP. This program is used to prepare the final plots, which illustrate the model's performance.

At this point it may not be clear why all four programs are not integrated into one large program. This may be accomplished, for example, by writing each program as a subroutine and creating a small driving program. The reasons for structuring the system in its present form are based mainly on computing and user-oriented considerations. Once a particular data file is created, it may be employed many times while changes are made in the other data file, thus eliminating unnecessary data processing. Consider the following two cases. One emissions inventory may, for example, be used in conjunction with various meteorological conditions, which is in effect the procedure adopted when model validation runs are made for several different days. Similarly, one set of meteorological conditions may be combined with different emissions inventories to test the effectiveness of emission control strategies.

While the two cases discussed above are illustrative of the computational savings inherent in the present package structure, user-oriented considerations are even more important. To successfully perform an airshed simulation, all inputs to the model must be specified correctly.

*An "instantaneous" concentration is a concentration predicted at a particular time during the course of the numerical integration.

FIGURE 4. TYPICAL COMPUTER DISPLAY OF THE HOURLY-AVERAGED GROUND LEVEL CONCENTRATIONS

AVERAGE GROUND LEVEL CONCENTRATIONS (PPHM) OF O3 BETWEEN THE HOURS OF 1000. AND 1100. PST																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
25	4	4	4	3	3	3	4	9	11	8	4													
24	4	3	3	3	4	8	20	22	16	8														
23	3	3	3	3	6	12	23	30	29	20	10	6												
22	2	2	2	3	5	9	15	23	33	34	21	10	7	7	9									
21	2	2	2	2	5	8	12	17	24	37	32	18	11	9	10	13	14	13	10	8	6	9	4	4
20	4	4	4	3	2	4	8	12	16	18	26	33	25	16	11	11	10	7	5	4	3	3	3	3
19	4	4	4	3	3	5	9	11	10	14	24	24	17	11	9	7	7	6	4	3	3	3	3	3
18	3	3	3	3	3	4	5	6	6	8	16	18	14	9	6	5	4	3	3	2	2	2	2	2
17	3	3	3	3	3	3	3	3	3	6	13	14	11	10	7	4	3	3	3	2	3	3	3	3
16	4	3	3	2	2	2	2	3	6	13	13	10	10	8	5	4	4	3	3	3	3	3	3	4
15	4	3	2	1	1	2	7	13	13	10	8	7	5	6	6	5	4	2	3	4	5			
14	3	1	1	1	2	6	11	12	9	7	5	5	7	8	7	5	4	4	5	5				
13	3	1	1	1	3	5	8	9	7	4	3	4	7	10	9	7	5	5	5	6				
12	1	1	1	1	3	4	5	6	5	3	2	3	7	10	11	8	6	6	6	6				
11	4	1	1	1	3	3	3	4	3	2	1	3	6	9	10	8	7	6	6	5				
10	4	2	2	3	2	2	3	3	3	2	1	2	5	7	8	7	7	6	5	5				
9	4	3	3	3	2	1	2	2	2	2	1	2	4	4	6	6	6	6	6	6				
8	4	4	3	3	2	1	2	3	2	1	2	3	2	4	5	4	4	4	4	4				
7	4	4	4	3	3	3	3	4	3	3	4	3	2	2	3	3	4	3	3	4				
6	4	4	4	4	3	3	4	5	4	5	6	4	2	2	3	3	3	3	4	4				
5																								
4																								
3																								
2																								
1																								

Considering the number and types of parameters involved, it is convenient to treat the input of emissions and meteorological data separately. This enables the user to concentrate fully on the task of establishing the emissions and meteorological data files. Thus, the EDF and the MDF are created and checked for accuracy and correctness before an airshed simulation is attempted. The contents of the EDF and the MDF are listed in the program output of the EDPP and the MDPP respectively.

This concludes our discussion of the general system considerations. In the next section we examine each of the four programs in sufficient detail to give the user a basic understanding of individual program structure and capabilities.

II. DESCRIPTION OF THE PROGRAMS

A. The Emissions Data Preparation Program

1. Program Objective and Capability

Pollutant emissions from automobiles, aircraft, and distributed fixed sources are combined in the Emissions Data Preparation Program to produce a total flux of each pollutant species into every ground level grid cell. The fluxes are stored in the Emissions Data File for future use by the APSP. Calculation of the fluxes requires an emissions model and inventory. The emissions model forms the basis for the algorithms in the code, while the emissions inventory serves as the input data to the program. To fully appreciate the scope of a comprehensive emissions model and inventory for a large urban area, the user is encouraged to read Appendix A of Roth et al. (1971), and Appendix A in Volume I of this report.

Since most source emissions rates undergo diurnal variations, fluxes are calculated at a sufficient number of times throughout the day to represent the characteristic temporal changes. In the present study, we calculate emissions at five minute intervals between 0500* and 1000 hours, and hourly thereafter. For convenience, all times used in this study are Pacific Standard Time (PST). The emissions inventory, however, is based on "local time". We note that when daylight savings time is in effect, local time and standard time differ by one hour. Therefore, we include the appropriate logic in the EDP to make a one hour shift in the emissions for use on those days when local time and standard time do not correspond.

An important point must be made regarding the treatment of sources. Emissions from large point sources, such as power plants, are treated separately in the APSP. Thus, two fixed source inventories are required. The first contains all distributed, ground-based fixed source emissions, such as those from petroleum marketing operations. These sources are processed by the EDP. The second fixed source inventory includes the remaining point sources, which only emit pollutants from a relatively few locations. Typically, these sources inject pollutants into the atmosphere from high stacks, which makes it inappropriate to treat them with the other ground-based sources. The point source inventory is input to the APSP on punched cards, while the ground-based emissions are input to the APSP using the EDP.

We wish to note that the EDP is presently structured to make computations of emissions between 0500 and 1655 hours. However, the program can easily be modified to compute emissions to 2355 hours. Further alterations to the code will be required to compute emissions prior to 0500 hours, or after 2400 hours (i.e., into the next day). In Section III, we include instructions for extending the computation of emissions from 1655 to 2355 hours.

*0500 hours corresponds to 5 A.M.

The EDPF is primarily used to create the EDF. This file contains the information needed by the APSP to calculate ground level emissions fluxes. In the following discussion we explain the structure of the EDF. The discussion is illustrated in Figures 5 and 6.

First, emissions fluxes are calculated for all species at the starting time, 0500 hours, and written on the EDF. Then emissions fluxes are calculated at 0505 hours. If we assume that the flux varies linearly between 0500 and 0505 hours, the time rate of change of the emissions flux is given by

$$\frac{dQ_{l,i,j}}{dt} = \frac{Q_{l,i,j}(0505) - Q_{l,i,j}(0500)}{5 \text{ minutes}} \quad \text{for } 0500 \leq t \leq 0505,$$

where $Q_{l,i,j}(t)$ is the flux of species l from grid square (i,j) at time t .

Note that we can calculate any value of $Q_{l,i,j}(t)$, where $0500 \leq t \leq 0505$, if we know $Q_{l,i,j}(0500)$, since

$$Q_{l,i,j}(t) = Q_{l,i,j}(0500) + \frac{dQ_{l,i,j}}{dt} (t-0500)$$

The two times, 0500 and 0505, are written on the EDF followed by values of the time rate of change of the emissions fluxes.

Next, we compute the emissions fluxes at 0510 hours and again assume linear time behavior. We calculate the time rate of change of the fluxes, as before, applicable between 0505 and 0510 hours. The two times, 0505 and 0510 are written on the EDF followed by values of the time rate of change of the emissions fluxes. To obtain the values of the emissions fluxes at any time t , we simply reconstruct the connected line segment curves (see Figures 5 and 6) using the initial fluxes, the time intervals, and the slopes of the lines (i.e., $dQ_{l,i,j}/dt$). This is essentially the way in which emissions fluxes are calculated by the APSP from the information contained in the EDF.

2. Program Structure

The EDPF consists of a MAIN program and one subprogram, TIME.

MAIN

Structurally, the MAIN program is divided into four sections. The first section is devoted to program initialization, which involves the input of the emissions inventory. In the second section, emissions are calculated every five minutes between 0500 and 0955 hours. The time rate of change of the emissions fluxes (ppm-ft/min^2) are computed and written in the EDF. The third section is very similar to the second, except emissions fluxes are calculated hourly from 1000 to 1655 hours. Since the temporal distribution

FIGURE 5
 ASSUMED TEMPORAL VARIATION OF THE EMISSIONS FLUX AT A
 PARTICULAR LOCATION BETWEEN 0500 AND 0955 HOURS

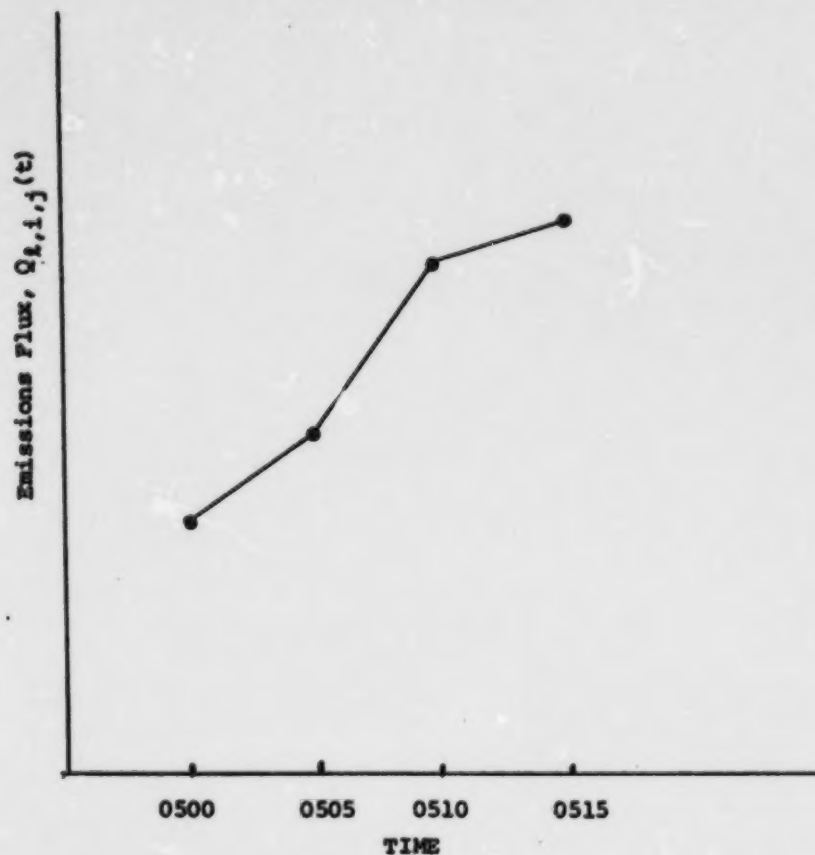
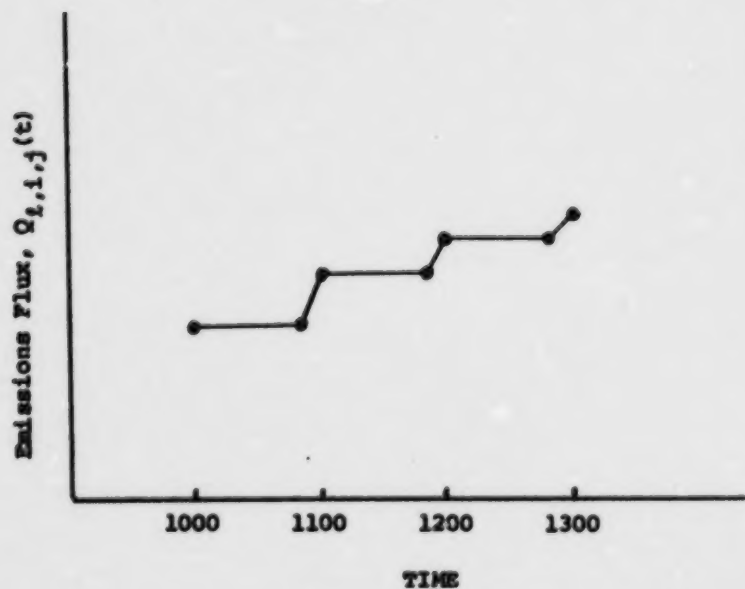


FIGURE 6
 ASSUMED TEMPORAL VARIATION OF THE EMISSIONS FLUX AT A
 PARTICULAR LOCATION AFTER 1000 HOURS



of automobile emissions is constant over hourly periods but discontinuous from one hour to the next, the computation for each hour takes place in two steps. Emissions rates are assumed constant over the first 55 minutes of the hour. Then from the 55 minute point to the beginning of the next hour, the emissions vary linearly in time between the two hourly values (see Figure 6).

In the last section of the EDPP, emissions fluxes are calculated using the newly created EDF. The fluxes applicable at the beginning of each hour are printed on the program output to provide a partial record of the contents of the EDF.

TIME (T1, T2, M)

Three types of arithmetic operations involving times in minutes and times based on a 2400 hour clock are performed in function subprogram TIME.

If M=1, add T2 to T1 and return the sum, where T1 is 2400 hour time, and T2 has the units of minutes. For example, if T1=0530 and T2=40, the result is 0610 (add 40 minutes to 5:30 A.M. to obtain 6:10 A.M. = 0610 hours).

If M=2, subtract T2 from T1, where T1 and T2 are 2400 hour times. The result is expressed in minutes. For example, if T1=0610 and T2=0530, the result is 40 minutes.

If M=3, the operation is analogous to that with M=1, except a subtraction is performed. If T1=0610 and T2=40, the result is 0530 (subtract 40 minutes from 6:10 A.M. to obtain 5:30 A.M.=0530 hours).

3. Input Data Requirements

The following outline lists the general types of information that must be provided as inputs to the EDPP. See Table 2 for a complete summary of the input data required by the program.

a. Automotive Emissions

- daily miles driven on all streets (excluding freeways) in each grid square
- daily miles driven on freeways in each grid square
- hot and cold start emissions factors
- fraction of vehicles cold started
- correction factor (β) for the nonuniform distribution of trip starts
- freeway driving speeds in the fast and slow directions
- emissions - driving speed correlation factors
- ratio of freeway vehicle miles driven in the slow direction to the number driven in the fast direction
- temporal distributions of freeway and non-freeway traffic activity

b. Aircraft Emissions (Ground Operations)

- number of daily aircraft flights at each airport
- temporal distribution of aircraft activity
- emissions/aircraft engine
- number of aircraft engines/aircraft

c. Fixed Source Emissions (Ground-Based)

- total distributed fixed source emissions from each grid square

4. Program Output

The output of the EDPF consists of the EDF and the printed listing of hourly values of the emissions fluxes. The units of the fluxes displayed on the printed output are ppm-ft/minute. Examples of the printed output are included in Section IV.

B. The Meteorological Data Preparation Program

1. Program Objective and Capabilities

Digitized wind speed, wind direction, and mixing depth maps are converted in the MDPF to a format suitable for input to the APSP. The meteorological data is then placed in the Meteorological Data File, where it can be accessed at a later time. Thus, the operation performed by this program is basically that of transferring information from cards to tape or disc.

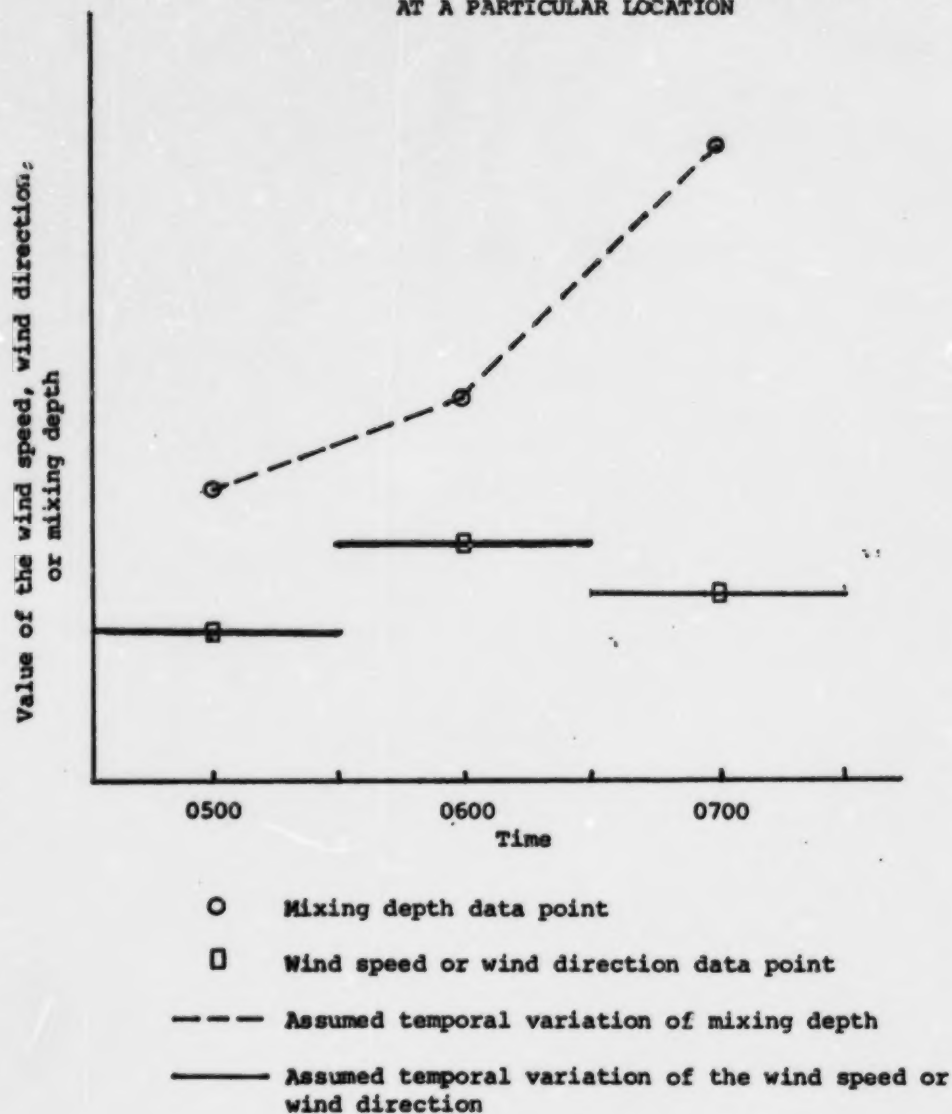
Hourly-averaged wind speed and wind direction maps must be prepared for each hour to be simulated. The time averaging is assumed to extend from the half hour to the half hour. Thus, wind speeds applicable at 0500 hours, for example, are obtained from the 0430 - 0530 wind speed map. Mixing depth maps are also prepared hourly, applicable at the beginning of each hour (i.e., at 0500 PST, 0600 PST, and etc.). Mixing depths are assumed to vary linearly in time between the values prescribed at two consecutive hours. In Figure 7, we represent the assumed temporal changes of the wind speed, wind direction, and the mixing depth.

In the following discussion, we describe the structure and content of the MDF. Initial values of the mixing depth at 0500 hours are read from the data-deck and placed directly in the MDF. Next, wind speeds, wind directions, and the time rate of change of the mixing depths are determined, applicable between 0500 and 0530 hours. The wind data are obtained from the data-deck, as are the values of the mixing depths at 0600 hours. The time rate of change of the mixing depths are calculated in the following manner. Assuming linear temporal behavior, the rate of change for the mixing depth at grid square (i,j) is given by:

$$\frac{d\Delta H_{i,j}}{dt} = \frac{\Delta H_{i,j}(0600) - \Delta H_{i,j}(0500)}{60 \text{ minutes}}$$

for $0500 \leq t < 0600$

FIGURE 7
TREATMENT OF THE TEMPORAL CHANGES
IN WIND SPEED, WIND DIRECTION, AND MIXING DEPTH
AT A PARTICULAR LOCATION



The time interval, designated by 0500 and 0530, is written on the MDF followed by values of the wind speed (feet/minute), wind direction (radians), and time rate of change of the mixing depth (feet/minute). We summarize below the order in which the first hour of meteorological data is arranged in the MDF.

- . Mixing depths at 0500 PST
- . Time interval, designated by 0500 and 0530, over which the following data are applicable
- . Wind speeds
- . Wind directions
- . Time rate of change of the mixing depths
- . Next time interval, designated by 0530 and 0600, over which the following data are applicable
- . Wind speeds
- . Wind directions
- . Time rate of change of the mixing depths

Succeeding blocks of meteorological data are arranged as follows:

- . Time interval, designated by t_1 and t_2 , over which the following data are applicable
- . Wind speeds
- . Wind directions
- . Time rate of change of the mixing depths

2. Program Structure

The MDPP is composed of a MAIN program and one subprogram, TIME.

MAIN

The MAIN program is used to perform two basic functions. First, meteorological input data supplied on punched cards is converted into a format suitable for input to the APSP and written on tape or disc. Wind speeds are converted from miles/hour to feet/minute, and wind directions are converted from degrees to radians. After all meteorological data is written in the MDF, hourly printed maps of wind speed, wind direction, and mixing depth are produced. These maps provide a complete summary of all meteorological data contained in the MDF.

TIME (T1, T2, N)

See the description given in the discussion of the EDPP.

3. Input Data Requirements

The following information must be supplied on punched cards for each hour

- Wind speeds
- Wind directions
- Mixing depths

A complete description of the order and format of the input data is given in Table 3.

4. Program Output

The primary output of the MDPP is the MDF. In addition, printed hourly maps of wind speed (m.p.h. x 10), wind direction (degrees), and mixing depth (feet) are also produced. Typical examples of the printed output are included in Section IV.

C. The Atmospheric Pollution Simulation Program

1. Program Objective and Capabilities

The actual airshed simulation is performed by the APSP. Meteorological inputs consisting of wind speed, wind direction, and mixing depth are obtained from the data in the MDF, while ground level emission inputs are calculated from information in the EDF. The simulation involves the numerical integration of the governing model equations by the finite-difference techniques described in Appendix D of Volume I of this report. The primary objective of the APSP is the prediction of ground level pollutant concentrations of both inert and photochemical species on a grid such as that illustrated in Figure 1.

Several useful features have been incorporated in the APSP. At present, the program is capable of simulating up to six chemical species. Each species is designated by a number, and we have adopted the following convention for this study:

Species Number	Species Name
1	Reactive Hydrocarbon
2	Nitric Oxide
3	Ozone
4	Nitrogen Dioxide
5	Carbon Monoxide
6	Unreactive Hydrocarbon

This numbering convention is consistent with that used in the EDPP. A full photochemical simulation involves all six species, but it is possible to operate the program simulating fewer species. The following list contains all the possible combinations of species that can be simulated simultaneously:

- a. species 1, 2, 3, 4, 5, and 6
- b. species 1, 2, 3, 4, and 5
- c. species 5 and 6
- d. species 5 or 6

The user specifies which species are to be simulated as part of the input data to the APSP. During photochemical validation studies, we use this feature as follows. First, CO is simulated to test the meteorological and automotive source inputs. If the results indicate that these parameters are specified correctly, then a full photochemical simulation is carried out involving all six chemical species. We also note that other inert species can be substituted for CO and/or unreactive hydrocarbon simply by changing a few input parameters in the data-deck of the program.

Another important feature designed into the program is the capability of performing the numerical integration on an irregularly shaped grid. We note in Figure 1, that many grid squares are located over the Pacific Ocean and the San Gabriel Mountains. It is computationally advantageous to eliminate these low population areas since a 30% reduction in the total computing can be realized. To generalize this procedure, the shape of the modeling region is specified as part of the input data to the program. In Figure 1, we illustrate that portion of the original 25x25 ground level grid layout actually used in the Los Angeles simulation study.

The chemical kinetic mechanism is an important component of this simulation model. The mechanism is also subject to change as further studies of atmospheric chemistry are carried out. Since rate constants are treated as input data to the program, they can easily be changed at any time. The mechanism currently employed in the APSP is described in Appendix B of Volume I of this report. To alter the formulation of the mechanism in the program, minor changes in the code are required. In Section III, we include a detailed discussion of these changes.

Before closing this section, we wish to mention that the coding of the APSP has been formulated very carefully. We note that a major portion of the total computing time is spent solving the governing model equations. Therefore, computational efficiency is stressed in the coding of the numerical integration procedure. In other sections of the code, general utility is considered more important. In the next section, we discuss in more detail the structural and computational aspects of the APSP.

2. Program Structure

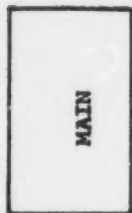
The APSP consists of a MAIN program and several subroutines. In Figure 8 we show a schematic diagram of the structure of the APSP.

MAIN

Two tasks are performed by the MAIN program:

- (1) the control of model initialization
- (2) the numerical integration of the governing airshed equations

FIGURE 8



Model initialization consists of the following procedures that must be performed before the numerical integration can be initiated:

- input of program operating parameters specified on punched cards
- open the EDF and initialize the ground level pollutant flux array (subroutine SOURCE)
- open the MDF and initialize all meteorological variables (subroutine METEOR)
- establish the initial concentration distribution (subroutine ICCONC)

After all parameters in the model have been initialized, the airshed simulation may proceed. Predicted concentrations are obtained by integrating the governing equations in discrete steps over time. The operations involved in advancing from one instant in time to the next, over a discrete time interval, are as follows:

- establish the size of the integration time step
- update meteorological variables (subroutine METEOR) and the distribution of elevated point source emissions (subroutine PTSOUR)
- update ground level emissions fluxes (subroutine SOURCE)
- increment the time-integrated ground level concentration array and the time-integrated station prediction array (entry point CALIVC in subroutine AVCONC)
- update boundary concentrations on the horizontal boundaries (subroutine BCCONC)
- perform Steps I and II of the numerical integration procedure - integration in the x and y directions
- perform Step III of the numerical integration procedure - integration in the z direction; the following calculations are involved:
 1. compute turbulent diffusivities (subroutine DIFCOF)
 2. solve the finite-difference equations for inert species (subroutine SIMDIG)
 3. solve the finite-difference equations for reactive species (subroutine BLCKT)
- increment the time-integrated ground level concentration array and the time-integrated station prediction array (entry point CALIVC in subroutine AVCONC)
- print hourly-averaged ground level concentrations and station predictions if one hour has elapsed since the last hourly-averaged concentrations were printed (subroutines AVCONC and MAPPER)

When the simulation has been completed, the user may specify that the entire concentration field be dumped onto a save disc/tape area. These concentrations may be used at a later time as initial conditions in a program restart. The restart procedure is discussed further in Section III.

AVCONC

All tasks related to the calculation and printing of the hourly-averaged predicted concentrations are performed in subroutine AVCONC. Hourly-averaged concentrations are calculated at every ground level cell on the grid, and at each air quality monitoring station. We define the hourly-averaged concentration as follows:

$$\bar{c} = \frac{\int_{t_0}^{t_0+60} c(t) dt}{60 \text{ minutes}} \quad (1)$$

where

- $c(t)$ is the concentration predicted at time t ,
- $\bar{c}$ is the hourly-averaged concentration, and
- t_0 is the beginning of the time interval over which the concentrations are averaged.

The integration is approximated numerically by the trapezoidal rule. Since monitoring stations are not, in general, located at the center of a ground level grid cell, we interpolate for the predicted concentration at the station using the concentrations predicted in the four nearest ground level grid cells. The interpolation procedure is illustrated in Figure 9.

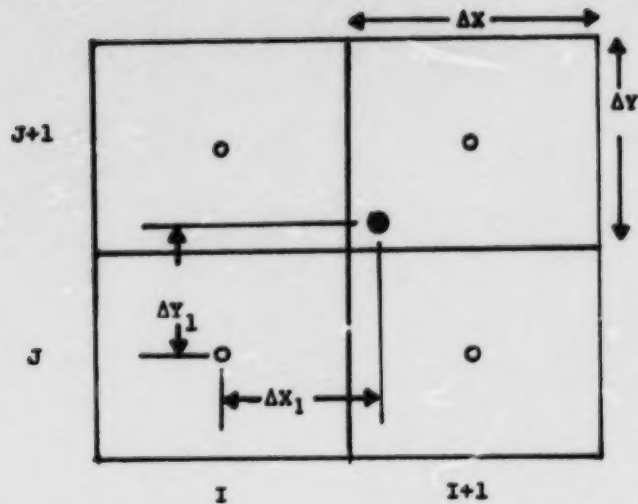
There are two entry points in subroutine AVCONC, and we now discuss the calculations performed in each.

1. Entry Point AVINIT

When AVINIT is entered from MAIN, the arrays which contain the numerical approximations of the integrals are all set to zero. This is an initialization procedure.

FIGURE 9

INTERPOLATION PROCEDURE FOR CALCULATING
THE PREDICTED CONCENTRATION AT A MONITORING STATION



● - monitoring station location

$$C_{\text{station}} = \left[C_{I,J}(1-\xi) + C_{I+1,J} \xi \right] (1-\eta) + \left[C_{I,J+1}(1-\xi) + C_{I+1,J+1} \xi \right] \eta$$

where $\xi = \frac{\Delta X_1}{\Delta X}$

$\eta = \frac{\Delta Y_1}{\Delta Y}$

2. Entry Point CALIVC

The numerical evaluation of the integration defined in Equation (1) is performed in CALIVC. The trapezoidal rule is employed and may be written as follows:

$$\int_{t_0}^{t_n} c(t) dt = \frac{1}{2} \sum_{i=0}^{n-1} [c(t_{i+1}) + c(t_i)] (t_{i+1} - t_i) \quad (2)$$

where

$$t_n = t_0 + 60 \text{ minutes}$$

and t_i designates a discrete point in time at which the governing equations of the model are solved.

Before the governing equations are integrated from t_i to t_{i+1} , CALIVC is entered, and the following values of A are calculated for each ground level grid cell and monitoring station.

$$A = \frac{1}{2} c(t_i) (t_{i+1} - t_i) \quad (3)$$

Arrays that will eventually contain the complete expression on the right hand side of Equation (2) for all ground level cells and stations are incremented by the appropriate value of A given in Equation (3).

After the governing equations have been integrated from t_i to t_{i+1} , CALIVC is again entered from MAIN, and the following values of B are calculated for each ground level cell and station.

$$B = \frac{1}{2} c(t_{i+1}) (t_{i+1} - t_i) \quad (4)$$

The arrays that will contain the expression in Equation (2) are this time incremented by the appropriate values of B given in Equation (4). If A and B are summed, we obtain:

$$A + B = \frac{1}{2} [c(t_{i+1}) + c(t_i)] (t_{i+1} - t_i)$$

which is one of the terms in Equation (2). When the governing equations have been integrated to t_n , the complete expression on the right hand side of Equation (2) is available for all ground level grid cells and monitoring stations. This completes our discussion of CALIVC.

AVCONC is called from MAIN once each hour, and the expression for each ground level grid cell and monitoring station given in Equation (2) is divided by 60 minutes to yield the hourly-averaged concentrations. Then the following output is produced by this subroutine:

- . printed hourly-averaged ground level concentration maps for each species (see Figure 4 and Section IV)
- . printed summary of the hourly-averaged concentrations predicted at the monitoring stations (see Section IV)
- . punched cards containing the hourly-averaged concentrations predicted at the monitoring stations

AVINIT

An entry point in subroutine AVCONC (see AVCONC).

BCCONC

In Steps I and II of the numerical integration procedure (integration in the x and y directions), pollutant concentrations are required at points of horizontal inflow to the model. During the simulation, subroutine BCCONC is called from MAIN to update the values of the boundary concentrations. These concentrations are inputs to the model and included in the data-deck of the APSP. A concentration specified at a particular point on the boundary is assumed to apply at all levels between the ground and the inversion base.

To account for temporal changes, the boundary concentrations are allowed to vary in time in a stepwise manner. The user defines a time interval (designated by two times) and a set of boundary concentrations that are to apply during that time interval. For example, to specify a set of boundary concentrations that are to apply between 0500 and 0600 hours, the time interval is designated by the two times, 0500 and 0600.

The operational characteristics of BCCONC are best illustrated by an example. Suppose we wish to perform a two hour simulation from 0500 to 0700 hours, and also suppose that the boundary concentrations are to change hourly. Thus, we specify a set of boundary concentrations that apply from 0500 to 0600 hours, and another set that apply from 0600 to 0700 hours. The cards in the data-deck are arranged in the following order (see Card No. 18-19 in Table 4):

- . time interval, designated by 0500 and 0600, and boundary concentrations that apply between 0500 and 0600 hours
- . time interval, designated by 0600 and 0700, and boundary concentrations that apply between 0600 and 0700 hours.

The first time BCCONC is called from MAIN, the time interval and boundary concentrations are determined from the first set of data cards. Thus, a set of boundary concentrations are established and applied between 0500 and 0600 hours. Each time BCCONC is called to update the boundary concentrations, the current simulation time is checked against the time interval. In the present example, when the simulation time finally becomes greater than 0600 hours, the next time interval and boundary concentrations are read from the data-deck. These concentrations that apply from 0600 to 0700 hours are then used for the remainder of the simulation.

When photochemical simulations are performed, ozone concentrations at the boundary are determined by assuming that the rate of reaction of ozone is equal to zero. Upon making this assumption and utilizing the reaction rate expression given in Appendix B of Volume I, we obtain the following algebraic relation for the boundary concentration of ozone:

$$[O_3] = \frac{k_2 [O]}{k_3 [NO] + k_4 [NO_2] + k_{13} [HC]}$$

where

$$[O] = \frac{k_1 [NO_2]}{k_2 + k_{11} [HC]}$$

and $[NO]$, $[NO_2]$, and $[HC]$ are the boundary concentrations of NO, NO_2 , and reactive hydrocarbon respectively.

BLCKTD (N,M)

Subroutine BLCKTD is used to solve a block-tridiagonal system of N-M linear equations. Each block is an M x M matrix, and all off-diagonal matrices are assumed to be diagonal. A discussion of the algorithm is presented in Appendix D of Volume I. The solution of a system of equations in this form is required as part of the numerical integration procedure.

CALIVC

An entry point in subroutine AVCONC (see AVCONC).

DIFCOF (I,J,KZ)

In Step III of the numerical integration procedure, vertical turbulent diffusivities must be determined to compute the vertical diffusion of pollutants. Vertical diffusivities are specified in the array KZ applicable in grid cells above grid square (I,J). KZ(K) is the value of the diffusivity at the interface between grid cells (I,J,K-1) and (I,J,K). See Appendix C of Roth et al. (1971) for a discussion of the algorithm.

ICCONC

The initial concentration distribution is established in subroutine ICCONC. Two modes of initial concentration input are possible. In the first mode, the initial ground level concentrations are read from cards included in the data-deck. The values in the ground cells are extended vertically to the inversion to complete the definition of the initial concentration field. The second mode of input arises when a simulation begins at a point in time at which a previous simulation terminated. Recall from our discussion of the MAIN program that at the end of a simulation, the entire concentration field may be "dumped" onto a save disc area. Thus, the second mode of initial concentration input simply consists of a READ statement to read these "dumped" values.

Initial ozone concentrations are determined by making the assumption that the rate of reaction of ozone is equal to zero at the starting time of the simulation. Using the reaction rate expression for ozone given in Appendix B of Volume I, we obtain

$$[O_3] = \frac{k_2 [O]}{k_3 [NO] + k_4 [NO_2] + k_{13} [HC]}$$

where

$$[O] = \frac{k_1 [NO_2]}{k_2 + k_{11} [HC]}$$

and $[O_3]$, $[NO]$, $[NO_2]$, and $[HC]$ are the initial concentrations of O_3 , NO , NO_2 , and reactive hydrocarbon respectively.

MAPPER (I, IHOLD, ISTART, ISTOP, APRINT)

This subroutine is used during the printing of the ground level concentration maps to produce "blanks" in those locations on the map which are outside the computational grid. For example, cells over the Pacific Ocean are not included in the current simulation study of Los Angeles. Note that in Figures 3 and 4, no concentrations are printed in areas of the grid over the Pacific Ocean. The blanks printed in this area are a direct result of the use of subroutine MAPPER.

The subroutine operates as follows. Before a particular row of ground level predictions are printed in subroutines AVCONC or PRINT1, the concentrations in that row are stored in the array IHOLD. Next, the values in IHOLD which represent predictions within the computational grid are determined. These values are stored in IHOLD between IHOLD (ISTART) and IHOLD (ISTOP). This information is used in subroutine MAPPER to produce the array APRINT, which is returned to the calling program. This alphameric array is then printed (128 printing columns) in the calling program, and only numbers within the computational grid appear on the printed map. If $I = 0$, integers are produced on the printed output. To obtain numbers with one decimal digit, we set $I = 1$. We note that this subroutine is written in Assembly Language.

METEOR

The processing of all meteorological data is done in subroutine METEOR. During model initialization, the MDF is opened, and initial values of the meteorological variables are calculated. As the simulation progresses, the meteorological variables are updated as necessary by reading the file. See Appendix C of Roth et al. (1971) for a further discussion of the meteorological data. Subroutine PTSOUR is called from METEOR every time the wind changes speed or direction to establish the spatial distribution of emissions from elevated point sources.

PRINT1

Instantaneous concentrations are printed on the program output by subroutine PRINT1. Vertical concentration profiles above monitoring stations and ground level concentration maps are printed at regular

time intervals. We have found that an interval of 60 minutes between printouts gives a good indication of hourly trends and does not result in endless pages of unused computer output. A typical example of a ground level concentration map printed by this subroutine is illustrated in Figure 3. Other examples are included in Section IV. Subroutine MAPPER is used in the preparation of the ground level maps.

PTSOUR

Emissions from elevated point sources are distributed among several downwind grid cells in subroutine PTSOUR. The algorithm employed is described fully in Appendix A of Volume I. This subroutine is called from METEOR each time the wind changes speed or direction since the downwind distribution of the emissions is directly affected by a change in either of these parameters.

SIMDIG(N)

Subroutine SIMDIG is employed in the solution of a tridiagonal system of N linear equations. The computational algorithm is given in Appendix D of Volume I.

SOURCE

Ground level pollutant fluxes are calculated in subroutine SOURCE using the data contained in the EDF. During model initialization, the EDF is opened, and initial values of the fluxes are computed. SOURCE is called from MAIN throughout the course of a simulation to update the ground level fluxes.

TIME (T1, T2, M)

This subprogram is discussed as part of the EDPP.

3. Input Data Requirements

The following outline lists the types of input information needed to run the APSP. The detailed listing of all parameters is given in Table 4.

- . grid characteristics, including number of vertical strata, horizontal grid spacing, and shape of the region
- . starting and stopping time of the simulation
- . time interval between instantaneous concentration printouts
- . location of monitoring stations
- . rate, location, and temporal variation of major elevated point source emissions
- . integration parameters, including minimum and maximum time step size, relative error tolerance to be satisfied in the iterative solution of the nonlinear finite-difference equations, maximum number of iterations to be allowed in the iterative solution, and the initial size of the integration time step
- . rate constants, temporal variation of the photolysis rate constants, and values of the generalized coefficients
- . initial conditions
- . concentrations aloft
- . boundary concentrations at points of horizontal inflow

4. Program Output

Three types of output are provided by the APSP

- . printed hourly-averaged ground level concentration maps and a printed summary of the hourly-averaged concentrations predicted at each monitoring station
- . printed instantaneous ground level concentration maps and a printed summary of the instantaneous vertical concentration distribution above each monitoring station
- . punched cards for input to the DPP containing the hourly-averaged concentrations predicted at each monitoring station

See Section IV for examples of the printed output from the APSP.

D. The Data Plotting Program

1. Program Objective and Capabilities

The evaluation procedure adopted for the simulation study reported in Volume I requires that model predictions be compared with actual

measurements of pollutant concentrations. These comparisons are best made by displaying the temporal variation of the measured and predicted concentrations together on one plot. In this manner, similarities and differences in the two concentrations at any particular time are readily apparent. Thus, the primary objective of the DPP is the automatic preparation of plots of predicted and measured concentrations at each air quality monitoring station.

Available measurements of particular interest are those of total hydrocarbon (as parts per million carbon), NO, NO₂, CO, and oxidant. Before the air quality measurements can be plotted, however, they must be corrected to account for interferences caused by the presence of other pollutants. These interferences are discussed in Appendix E of Roth et al. (1971). The following corrections are made to the NO and oxidant measurements:

$$\text{NO}_{\text{plotted}} = 1.25 \text{ NO}_{\text{measured}}$$

$$\text{OX}_{\text{plotted}} = \text{OX}_{\text{measured}} - 0.15 \text{ NO}_{2\text{measured}} + \text{SO}_{2\text{measured}}$$

A useful feature of the DPP is that the user may specify, as part of the program input data, which species are to be plotted at each station. If measurements are not available for a particular species at a station, the DPP may be used to plot only the predicted results at that station. In fact, the user may wish to completely suppress the plotting since no comparisons can be made. As an example, total hydrocarbon is measured at six stations in the Los Angeles area. Thus, for evaluation purposes, we only prepare plots of the hydrocarbon concentrations at these six stations.

In Appendix C of Volume I, we describe a technique to account for the effects of near-by sources on the field measurements. These effects are especially important to include when a monitoring station is located adjacent to a heavily-traveled street. The local concentration elevations are calculated using the algorithms in the Appendix cited and included on punched cards in the data-deck of the DPP. These concentration elevations are then added to the model predictions to obtain an "improved prediction" at the station. We wish to note that, as of this writing, local corrections may be calculated only for inert species, such as CO, due to the nonlinear effects of chemical reactions.

2. Program Structure

The DPP consists of a MAIN program and three subroutines, each of which performs a specific task in the drawing of the plots. The creation of a plot may be described by the following four step process:

1. draw and label the axes; print the title block
2. plot the predicted concentrations
3. plot the station measurements
4. plot the locally corrected predicted concentrations

We now discuss the function of the MAIN program and each subroutine. The structure of the DPP is illustrated in Figure 10.

MAIN

In the first section of code in MAIN, all input cards are read, and the NO and oxidant measurements are corrected for interferences. Having accomplished this, the program is ready to make all plots specified by the user. The plots are drawn in the following order:

1. CO plots for each station
2. total hydrocarbon plots for each station
3. NO, NO₂, and O₃ plots for each station

We describe the operations performed in the MAIN program by discussing the manner in which a CO plot is made. First, the maximum CO concentration to be plotted is found, and the scale of the concentration axis is calculated accordingly. Then the data points are examined to be certain that none will be plotted in the title block located in the upper right hand corner of the plot (See Figure 11). If a data point does fall in the title block, then the concentration axis is scaled in such a manner that no data points will be plotted in this area.

FIGURE 10
THE STRUCTURE OF THE DPP

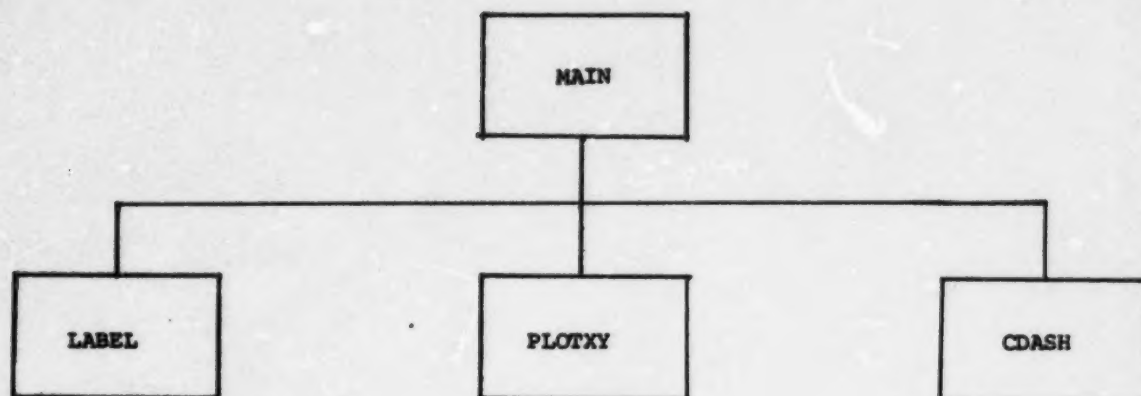
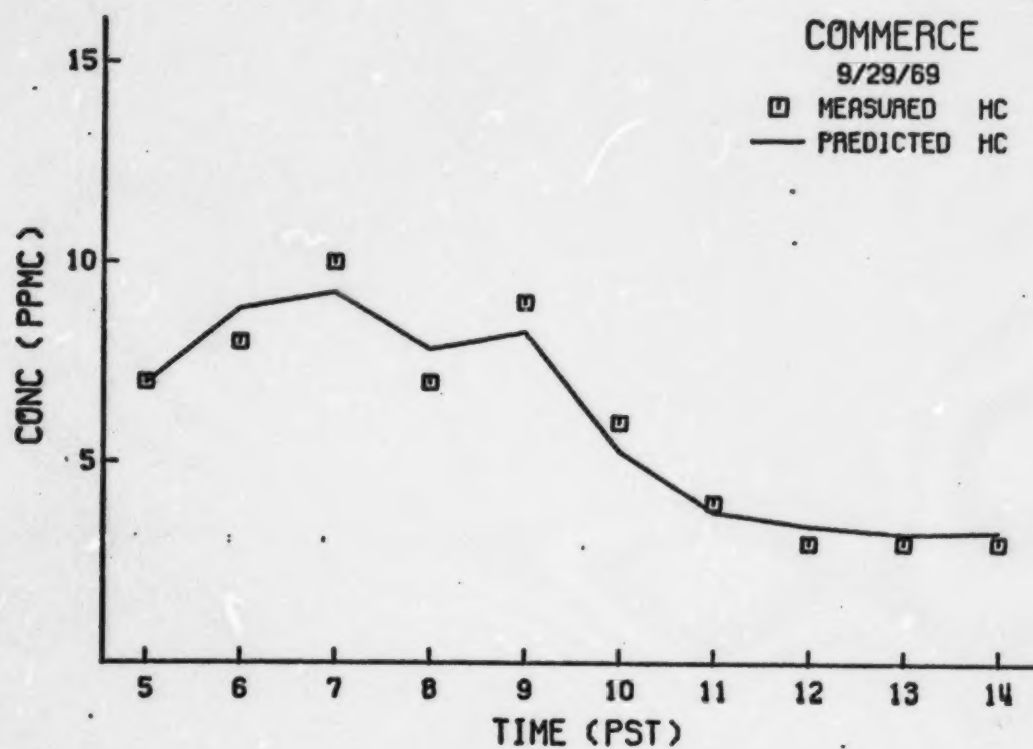
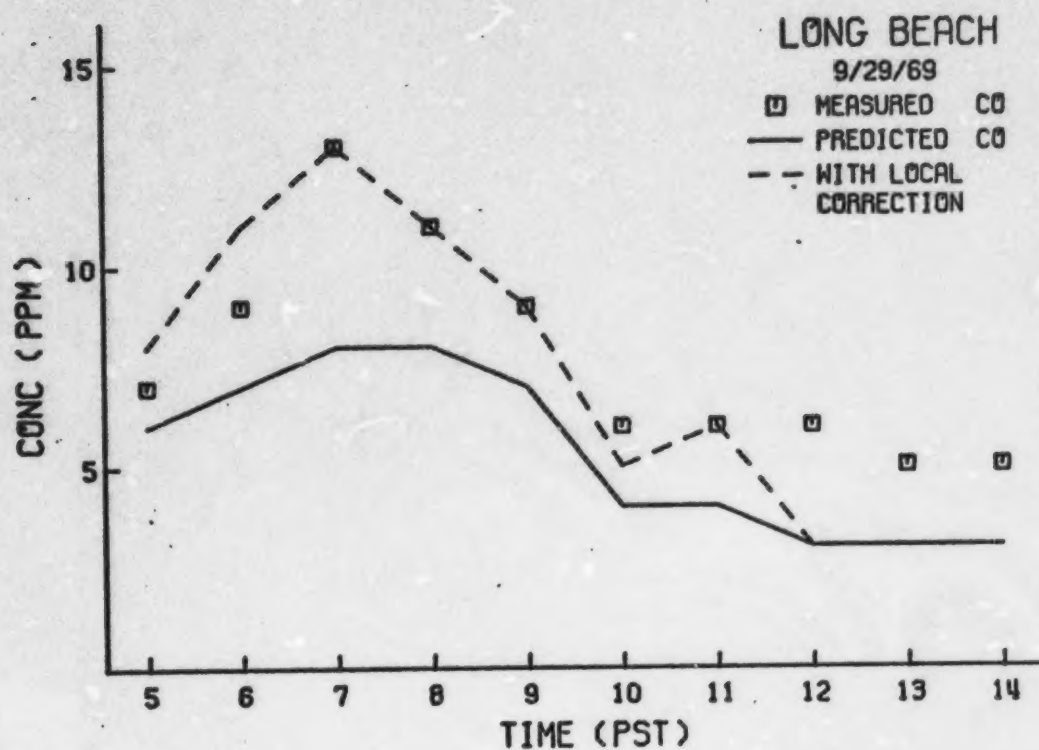


FIGURE 11
EXAMPLE OF PLOTS FOR CO AND TOTAL HYDROCARBON



After determining the scale of the concentration axis, subroutine LABEL is called to draw and label the two axes representing concentration and time. Then subroutine PLOTXY is called to plot the model predictions. This plot consists of solid line segments connecting the discrete hourly-averaged predictions. After the predictions have been plotted, subroutine PLOTXY is called again, this time to produce a symbol plot representing the measured concentrations. We note that the solid lines have no other meaning than to correct the predicted concentration data points and to provide a contrast to the discrete symbol plot.

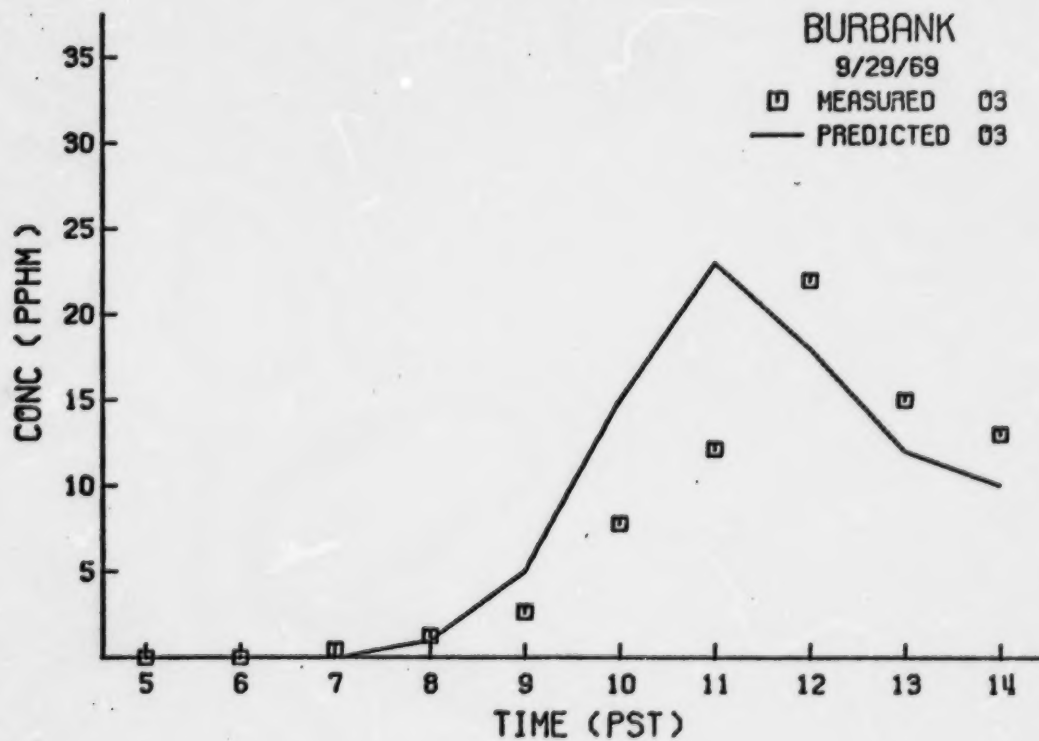
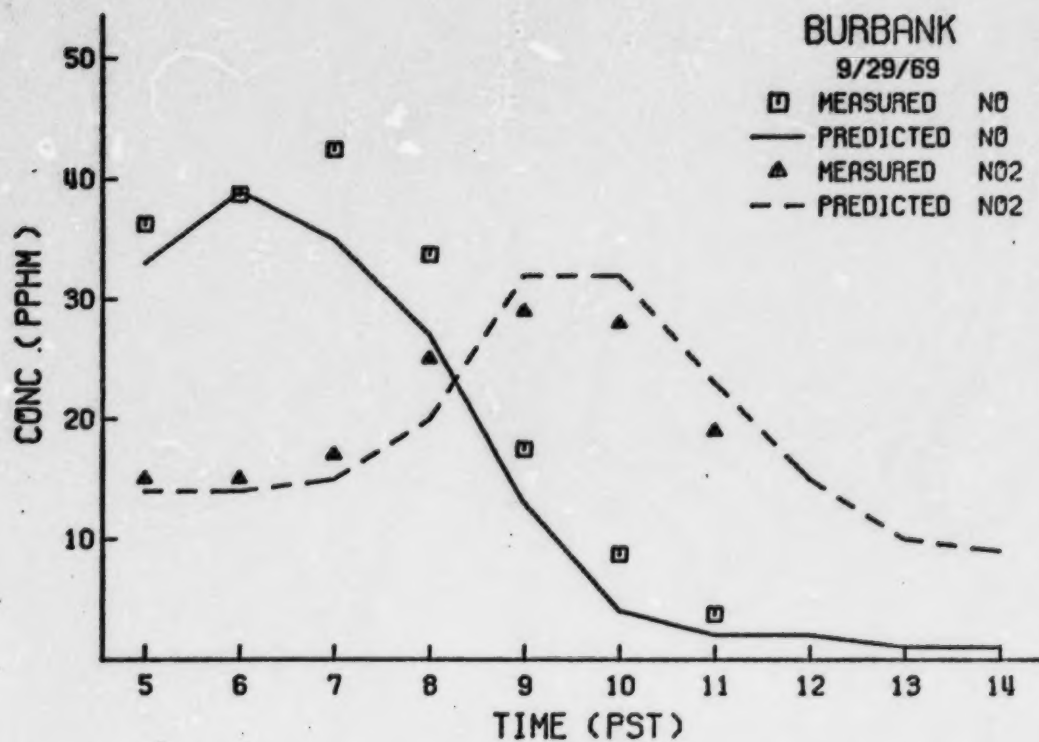
If local corrections are required, the predictions at the station and the corresponding local corrections are transferred to subroutine CDASH. An array is defined by CDASH consisting of model predictions augmented by the local corrections. This array is then plotted by PLOTXY as a dashed line. In Figure 11, we illustrate a typical CO plot drawn by the DPP.

The basic operations described above are repeated for each succeeding plot. All CO and total hydrocarbon plots are drawn, displaying two sets of results on each page. The format is somewhat different, however, for the display of the NO, NO₂, and O₃ results. In this case, the predictions and measurements for all three species at a particular station are presented on the same page. A typical plot involving these three species is given in Figure 12.

CDASH (NOHOUR, T, C, B, NOCORR, TCORR, CCORR)

Before the local corrections to the model predictions are plotted, the MAIN program supplies subroutine CDASH with the number of data points, NOHOUR, and three arrays T, C, and B, containing the times, model predictions, and local corrections respectively at the particular station. An array of times, TCORR, and an array of model predicted concentrations plus local corrections, CCORR, are calculated in subroutine CDASH. The number of data points in these arrays is equal to NOCORR. The MAIN program passes NOCORR, TCORR, and CCORR to subroutine PLOTXY, which then produces the dashed line plot representing the locally corrected model predictions.

FIGURE 12
EXAMPLE OF PLOTS FOR NO, NO₂ and O₃



LABEL (X,Y,N, XDATA, NY, YMAX, UNIT, DATE, STN, NONAME, NAME, CORECT)

Subroutine LABEL is used to 1) draw and label the axes, and 2) print the title block for each plot. The axes intersect at the point (X,Y) on the plotting area, where X and Y are measured in inches. N tick marks are drawn on the X axis, representing the N data points that will eventually be plotted. XDATA is an array of hours (or abscissa), and the subroutine uses this array to write the hours under the X-axis. NY is the number of increments into which the Y-axis is to be subdivided, and YMAX is the largest value to be represented on the axis. The Y-axis is labeled to reflect that it represents concentration, and the units (PPM, PPTM, or PPHM) are also written according to the alphameric information contained in the variable UNIT. For example, if the concentration units are to be pphm (parts per hundred million), then UNIT = 'PPHM'. DATE and STN are alphameric designations of the date and monitoring station name respectively, which appear in the title block. NONAME is the number of species to be plotted on the plot, and NAME is an alphameric array containing the abbreviation of each species' name. For example, an abbreviation for hydrocarbon is 'HC'. CORECT is a logical variable passed by MAIN to inform LABEL whether or not local corrections will be plotted on the current plot. If CORECT = .TRUE., then the local corrections will appear, and LABEL will make a comment to that effect in the title block.

PLOTXY (N,X,Y,XMN, XMX, YMN, YMX, IP, ISYS, SUPRES)

Subroutine PLOTXY is a general data plotting routine which is capable of making point, solid line, or dashed line plots. The program operates in a conventional manner, in which the user designates N points of an array of abscissa and ordinates, X and Y, to be plotted. The values of the abscissa on the left and right hand borders of the plotting area are specified by XMN and XMX. Similarly, the values of the ordinate on the bottom and top of the plotting area are YMN and YMX. The pen is moved from one data point to the next, where the location of the pen is determined by linear interpolation using the particular values of X and Y to be plotted, and the values of the abscissa and ordinate along the plotting area borders.

The type of plot produced by PLOTXY is controlled by the parameter IP, where

$$IP = \begin{Bmatrix} 0 \\ 1 \\ 2 \end{Bmatrix} \text{ produces a } \begin{Bmatrix} \text{symbol plot} \\ \text{solid line plot} \\ \text{dashed line plot} \end{Bmatrix}$$

The value of ISYS determines which symbol is plotted when IP = 0.

A symbol will not be plotted for any value of Y which is equal to SUPRES. This feature is used to denote a missing data point, and hence, no symbol should be plotted. For the simulation study reported in Volume I, we set all missing values of the measured concentrations equal to minus one. To correspond with this convention, we also set SUPRES equal to minus one.

The subroutine normally uses a 15 x 10 inch plotting area, but the user can alter this specification by including a BLOCK DATA subprogram as follows:

```
BLOCK DATA
COMMON/COMPXY/
DATA ITEST, XLNGTH, YLNGTH/1, ..., .../
END
```

where XLNGTH and YLNGTH are the altered X-length and Y-length of the plotting area, in inches, respectively. XLNGTH must be specified at least 8-1/2 inches, and YLNGTH must be specified at least 10 inches.

3. Input Data Requirements

The DPP requires the following types of input data:

- . number of carbon atoms per molecule of reactive and unreactive hydrocarbon
- . air quality measurements
- . model predictions
- . corrections due to local effects

The complete data-deck setup for the DPP is given in Table 5.

4. Program Output

The only output from the DPP are the plots, such as those illustrated in Figures 11 and 12.

III. OPERATING PROCEDURES

This section of the User's Guide is divided into two parts. In the first part, we give general instructions regarding the use of all programs. Included is a four or five step procedure outlining the manner in which each program is to be operated. The second part of this section is devoted to a presentation of the specific operating characteristics of each program. The following topics are discussed:

- . limitations in the use of the programs
- . instructions for making important changes in the codes
- . instructions for assembling the input data-deck
- . computing system information

Before discussing these specific details, however, we first consider the general operating procedures for the use of airshed simulation package.

A. General Information and Instructions

The main tasks involved in exercising the airshed simulation package are those of establishing the meteorological and emissions input data files, and then running the APSP. All programs, except the APSP, operate solely from punched card input data; the APSP requires inputs from both punched cards and the two data files. Consequently, we work primarily with the input data-deck to each program and are not required to make substantial coding changes in any of the programs. There are some model parameters that have been specified in the programs, however, and in the next section we discuss which parameters these are and where they are located in the code.

Assembling the input data-deck for each program is one of the most important aspects of operating the model. The data-decks for the EDPP, MDPP, and APSP consist of hundreds of cards, all of which must be specified correctly. As an aid in defining the contents and format of the data-decks, we have prepared, for all programs, tables listing the parameters appearing on each input card. The units of the parameter and the card format are included in the table.

Since the number of input data cards may vary from one simulation to the next, a generalized means of denoting the card order is employed in the data-deck tables. To illustrate this convention, we refer the reader to Table 4. We find that Card No. 1 actually consists of two physical cards on which the array NOTE is stored. Card No. 2, however, is only one physical card on which several input parameters are specified. The number of cards required to input arrays can be determined from the format information given in the table. For example, the format of Card No. 1 is 2(20A4). The "two" outside the parentheses denotes the number of physical cards.

The next topic we wish to discuss deals with making coding changes in the programs. In Section III-B, we discuss several alterations that

the user may wish to make in the codes. It is conceivable, however, that a change may be required that we have not discussed. If this is the case, the user should first determine which subroutine contains the algorithm of interest. The discussion in Section II will be helpful in this respect. The comments in the program can then be used to further pinpoint the location of the algorithm, and with the aid of the appropriate symbol glossary, minor code alterations can be made. Major alterations in any code will, of course, require that the user understand the basic computational structure of the program.

Another important consideration involves the use of subscripts in the codes. This is especially important since several multidimensional arrays are employed in the programs. We note that any grid cell may be addressed by the integer triple (I,J,K). The numbering convention for I and J is illustrated in Figure 1. K designates the vertical level in which the cell is located, where K = 1 corresponds to the ground level cells. Those variables which are independent of height are designated by the ordered pair (I,J). For example, since the wind direction is invariant with height above grid square (I,J), it is denoted as WINDAN(I,J). The pollutant concentration array, CONC(L,I,J,K), denotes the concentration of species L in grid cell (I,J,K), where

$$L = \begin{cases} 1 - \text{Reactive Hydrocarbon} \\ 2 - \text{NO} \\ 3 - \text{O}_3 \\ 4 - \text{NO}_2 \\ 5 - \text{CO} \\ 6 - \text{Unreactive Hydrocarbon} \end{cases}$$

Having discussed several topics related to the operation of the programs, we now present a set of instructions for the use of the airshed simulation package. These instructions are included in Table 1. Since the instructions are formulated in a general manner, they apply to all simulations performed by the programs given in this Guide. The user will find information pertaining to computing time, program size, pages of printed output, and hardware requirements for each program in the next section.

B. Program Operating Characteristics

1. The Emissions Data Preparation Program

The following parameters are specified in the code of the EDPP:

<u>Parameter</u>	<u>Card ID</u>	<u>Description</u>
XMOL	EDPP 0330	molecular weights of auto emissions species
WTFS	EDPP 0370	molecular weights of fixed source emissions species
DX	EDPP 0410	grid spacing in x-direction (feet)
DY	EDPP 0420	grid spacing in y-direction (feet)

TABLE 1
OPERATING INSTRUCTIONS

- A. EDPP - use this program to create the EDF
 - 1. Make any required coding changes
 - 2. Prepare the data-deck (use Table 2)
 - 3. Specify the JCL
 - 4. Run the program
- B. MDPP - use this program to create the MDF
 - 1. Make any required coding changes
 - 2. Prepare the data-deck (use Table 3)
 - 3. Specify the JCL
 - 4. Run the program
- C. APSP - use this program to perform the airshed simulation
 - 1. Create the EDF and the MDF (see A and B above)
 - 2. Make any required coding changes
 - 3. Prepare the data-deck (use Table 4)
 - 4. Specify the JCL
 - 5. Run the program
- D. DPP - use this program to plot the results obtained from the APSP
 - 1. Obtain model predictions from the APSP (see C above)
 - 2. Make any required coding changes
 - 3. Prepare the data-deck (use Table 5)
 - 4. Specify the JCL
 - 5. Run the program

<u>Parameter</u>	<u>Card ID</u>	<u>Description</u>
FAIRNO	EDPP 0470	mole fraction of NO in aircraft NO _x emissions
FCARHC	EDPP 0480	mole fraction of reactive hydrocarbon in auto hydrocarbon emissions
FCARNO	EDPP 0490	mole fraction of NO in auto NO _x emissions
FFSNO	EDPP 0500	mole fraction of NO in fixed source NO _x emissions
HCEVAP	EDPP 0590	molecular weight of evaporative hydrocarbon emissions from autos

These parameters must be checked for correctness before the EDPP is used.

We list below two alterations that may be required in the code.

- The temporal distribution for traffic activity is delayed by one hour in the Downtown Los Angeles area - grid squares (11,17), (12,17) and (12,16). See cards EDPP 1890, EDPP 1900, EDPP 1910 and EDPP 3060, EDPP 3070, EDPP 3080.
- Emissions are not calculated after 1655 hours. To compute emissions to a later time, the upper bound on the range of the DO loop at card EDPP 2940 should be increased, but specified no larger than 19.

We wish to note the following limitations on the use of the EDPP. These limitations can be overcome, however, with further program development.

- The calculation of emissions after 2355 hours should not be attempted.
- Emissions cannot be computed prior to 0500 hours.

Computing System Information

Hardware:

1 - disc area/tape drive	FT04F001
1 - card reader	FT05F001
1 - printer	FT06F001

Program Size: 130K bytes

CPU Time (IBM 370/155): 1 minute

Printed Output: 144 pages

In Table 2 which follows, we give a detailed specification of the data-deck setup for the EDPP.

TABLE 2
DATA-DECK SETUP FOR THE EMISSIONS DATA PREPARATION PROGRAM

Card No.	Column No.	Variable	Format	Units	Notes
1	1-80	YCS(I)	3(8F10.0)	--	Fraction of cars "cold-started" during hourly period I (I=1 corresponds to the period midnight to 1 A.M.); input sequence: (YCS(I), I 1,24)
2	1-30	EC(L)	3F10.0	grams/mile	Cold-start emissions from automobiles for species L, where $L = \begin{cases} 1 & \text{CO} \\ 2 & \text{HC} \\ 3 & \text{NO}_x \end{cases}$ input sequence: (EC(L), L=1,3)
2	31	PDT	L1	--	If daylight savings time is in effect, PDT=TRUE.; if standard time is in effect, PDT=FALSE.
3	1-30	EH(L)	3F10.0	grams/mile	Hot start emissions from automobiles for species L; input sequence: (EH(L), L=1,3)
4	1-30	XA(L)	3F10.0	--	The parameter "a" in the automotive speed-emissions correlation for species L; input sequence: (XA(L), L=1,3)

TABLE 2 (Cont'd)
DATA-DECK SETUP FOR THE EMISSIONS DATA PREPARATION PROGRAM

Card No.	Column No.	Variable	Format	Units	Notes
5	1-30	XB(L)	3F10.0	--	The parameter "b" in the automotive speed-emissions correlation for species L; input sequence: (XB(L), L=1,3)
6	1-80	TSURF(I)	3(8F10.0)	minute ⁻¹	Temporal distribution of non-freeway traffic; fraction of total daily miles driven in each grid square each minute during hourly period I; on input, this array is to be specified 10 ⁴ times larger than its true value; input sequence: (TSURF(I), I=1,24)
7	1-80	TFREE(I)	3(8F10.0)	minute ⁻¹	Temporal distribution of freeway traffic; fraction of total daily miles driven on freeways in each grid square each minute during hourly period I; on input, this array is to be specified 10 ⁴ times larger than its true value; input sequence: (TFREE(I), I=1,24)
8	1-75	SURMLG(I,J)	2B(25F3.0)	10 ³ miles	Total daily non-freeway mileage driven in grid square (I,J); input sequence: ((SURMLG(I,J), I=1,25), J=1,25)

TABLE 2 (Cont'd)
DATA-DECK SETUP FOR THE EMISSIONS DATA PREPARATION PROGRAM

Card No.	Column No.	Variable	Format	Units	Note
9	1-75	FWYMLG(I,J)	25(25F3.0)	10 ³ miles	Total daily freeway mileage driven in grid square (I,J); input sequence: ((FWYMLG(I,J), I=1,25), J=1,25)
10	1-72	BETA(M,L,K)	15(12F6.3)	--	The "beta" correction curve for species M accounting for the nonuniform distribution of vehicle starts, where $M = \begin{cases} 1 & \text{CO} \\ 2 & \text{HC} \\ 3 & \text{NO}_x \end{cases}$ and L designates the hour (L=1,5), where L=1,2,...,5 corresponds to 5 A.M., 6 A.M., ..., 9 A.M. K designates each 5 minutes of hour L, (K=1,12); input sequence: ((BETA(M,L,K), K=1,12), L=1,5), M=1,3)
11	1-65/1-60	VSL(I,J)	25(13F5.0 /12F5.0)	mph	Average automobile speed in the slow freeway direction in grid square (I,J) at 5 A.M. local time; input sequence: ((VSL(I,J), I=1,25), J=1,25)
12	1-65/1-60	VF1(I,J)	25(13F5.0 /12F5.0)	mph	Average automobile speed in the fast freeway direction in grid square (I,J) at 5 A.M. local time; input sequence: ((VF1(I,J), I=1,25), J=1,25)

TABLE 2 (Cont'd)
DATA-DECK SETUP FOR THE EMISSIONS DATA PREPARATION PROGRAM

Card No.	Column No.	Variable	Format	Units	Notes
13	1-65/1-60	FXSOUR(I,J,L)	150(13F5.0 /12F5.0)	Kgm./hr	Fixed source emissions for species L in grid square (I,J); input sequences: (((FXSOUR(I,J,L), I=1,25), J=1,25), L=1,6) where $\begin{cases} 1 & \text{reactive HC} \\ 2 & \text{NO} \\ 3 & \text{O}_3 \\ 4 & \text{NO}_2 \\ 5 & \text{CO} \\ 6 & \text{unreactive HC} \end{cases}$ L =
14	1-5	NOARPT	I5	--	Number of airports

If NOARPT=0, then do NOT include Card No. 15-23.

15	1-70	AIREMS(M,L,I)	18(7F10.1)	lb./min	Emissions rate of species L from class I aircraft in operating mode M, where $I = \begin{cases} 1 & \text{long range jet} \\ & \text{transport} \\ 2 & \text{medium range jet} \\ & \text{transport} \\ 3 & \text{business jet} \\ & \text{transport} \\ 4 & \text{turboprop trans-} \\ & \text{port} \\ 5 & \text{piston engine} \\ & \text{transport} \\ 6 & \text{piston engine} \\ & \text{utility} \\ 7 & \text{turbine engine} \\ & \text{helicopter} \end{cases}$
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TABLE 2 (Cont'd)
DATA-DECK SETUP FOR THE EMISSIONS DATA PREPARATION PROGRAM

<u>Card No.</u>	<u>Column No.</u>	<u>Variable</u>	<u>Format</u>	<u>Units</u>	<u>Note</u>
					$M = \begin{cases} 1 & \text{taxi} \\ 2 & \text{landing} \\ 3 & \text{take-off} \end{cases}$
					L - see Card No. 13 input sequence: (((AIRENS(M,L,I),I=1,7), L=1,6),M=1,3)
16	1-70	THODE(M,I)	3(7F10.0)	minute	The amount of time class I aircraft spend in opera- ting mode M; see Card No. 15 for description of I and M; input sequence: (THODE(M,I),I=1,7),M=1,3)
Include a complete set of Card No. 17-23 for each airport (J=1,NOAFT)					
17	1-4	AIRPT	A4	--	Alphanumeric designation of the airport initials (such as 'LAX','BUR', and etc.)
17	5-6	NSORT(J)	I2	--	Number of grid squares which receive emissions from airport J
18	1-30	IXORT(J,I)	6I5	--	Column numbers of the grid squares that receive emis- sions from airport J; input sequence: (IXORT(J,I),I=1,NOORT(J))

TABLE 2 (Cont'd)
DATA-DECK SETUP FOR THE EMISSIONS DATA PREPARATION PROGRAM

<u>Card No.</u>	<u>Column No.</u>	<u>Variable</u>	<u>Format</u>	<u>Units</u>	<u>Notes</u>
19	1-30	IYORT(J,I)	6I5	--	Row numbers of the grid squares that receive emissions from airport J; input sequence: (IYORT(J,I), I=1, NCORT(J))
20	1-60	DIST(J,I)	2(12F5.3)	hour ⁻¹	Fraction of total daily aircraft operations occurring at airport J during hour I (I=1 corresponds to the period midnight - 1 A.M.); input sequence: (DIST(J,I), I=1, 24)
21	1-78	PCT(J,I)	13F6.2	--	Fraction of emissions from airport J that are apportioned to grid square (IXORT(J,I), IYORT(J,I)); input sequence: (PCT(J,I), I=1, NCORT(J))
22	1-42	ACFT(J,I)	7F6.2	aircraft/ day	Number of daily flights of class I aircraft at airport J; input sequence: (ACFT(J,I), I=1, 7) See Card No. 15 for a detailed description of I.
23	1-42	EMIX(J,I)	7F6.2	engines/ aircraft	Number of engines on class I aircraft operating at airport J; input sequence: (EMIX(J,I), I=1, 7)

TABLE 2 (Cont'd)
DATA-DECK SETUP FOR THE EMISSIONS DATA PREPARATION PROGRAM

Card No.	Column No.	Variable	Format	Units	Note
24	1-65/1-60	X(I,J)	25(13F5.0/ 12F5.0)	--	Ratio of the number of miles traveled in the slow direction to the number traveled in the fast direction in grid square (I,J) between 5 and 6 A.M. local time; input sequence: ((X(I,J),I=1,25),J=1,25)
25	1-65/1-60	VSL(I,J)	25(13F5.0/ 12F5.0)	mph	Average speed traveled by automobiles in the slow direction on freeways in grid square (I,J) at 6 A.M. local time; input sequence: ((VS(I,J),I=1,25),J=1,25)
26	1-65/1-60	VFL(I,J)	25(13F5.0/ 12F5.0)	mph	Average speed traveled by automobiles in the fast direction on freeways in grid square (I,J) at 6 A.M. local time; input sequence: ((VF(I,J),I=1,25),J=1,25)

Include four additional sets of Card No. 24-26 to cover the time period 6 A.M. - 10 A.M.

2. The Meteorological Data Preparation Program

The MDPP is a general program, and the only limitations on its use are:

- mixing depths must be specified on the hour
- wind speed and wind direction are constant over hourly periods measured from the half hour to the half hour
- the initial mixing depths are to be applicable at the same time the airshed simulation is to start. That is, if a simulation is to start at 0500 hours, then the first mixing depth data should be applicable at 0500 hours. This is a limitation imposed by the APSP.

Computing System Information

Hardware:

1 - disc area/tape drive	FT04F001
1 - card reader	FT05F001
1 - printer	FT06F001

Program Size: 60K bytes

CPU Time (IBM 370/155):

time required to process 10 hours of meteorological data - 25 seconds

Printed Output:

number of pages of printed output from 10 hours of meteorological input data

10 hours x 3 pages/hour = 30 pages

The complete data-deck setup for the MDPP is described in Table 3.

3. The Atmospheric Pollution Simulation Program

We list below four operating parameters which are specified in the code of the APSP. They are all located in the MAIN program.

<u>Parameter</u>	<u>Card ID</u>	<u>Description</u>
KXY	APS 00850	horizontal turbulent diffusivity
NOSPEC	APS 00860	maximum number of chemical species
NORATE	APS 00870	number of chemical reactions
DTAVEC	APS 00910	time period (in minutes) over which the predicted concentrations are time averaged

TABLE 3
DATA-DECK SETUP FOR THE METEOROLOGICAL DATA PREPARATION PROGRAM

Card No.	Column No.	Variable	Format	Units	Note
1	1-5	NX	I5	--	Number of grid squares in the x-direction
1	6-10	NY	I5	--	Number of grid squares in the y-direction
1	11-20	TSTART	F10.0	2400 time	Starting time
1	21-30	TSTOP	F10.0	2400 time	Terminating time
1	31-38	DATE(I)	2A4	--	Alphanumeric designation of the date; input sequence: (DATE(I), I=1,2)
2	1-65/1-60	H(I,J,1)	25(13F5.0/ 12F5.0)	feet	Mixing depths applicable at TSTART; input sequence: ((H(I,J,1), I=1,NX), J=1,NY)
3	1-65/1-60	W(I,J)	25(13F5.1/ 12F5.1)	mph	Wind speed applicable at TSTART; input sequence: ((W(I,J), I=1,25), J=1,25)
4	1-65/1-60	A(I,J)	25(13F5.1/ 12F5.1)	degrees	Wind direction measured clockwise from north; applicable at TSTART; input sequence: ((A(I,J), I=1,25), J=1,25)
5	1-65/1-60	H(I,J,2)	25(13F5.1/ 12F5.1)	feet	Mixing depths applicable at the next hour; input sequence: ((H(I,J,2), I=1,NX), J=1,NY)
6	1-65/1-60	W(I,J)	25(13F5.1/ 12F5.1)	mph	Wind speeds applicable at the next hour; input sequence: ((W(I,J), I=1,25), J=1,25)

* The direction in which the wind is flowing.

TABLE 3 (Cont'd)
DATA-DECK SETUP FOR THE METEOROLOGICAL DATA PREPARATION PROGRAM

<u>Card No.</u>	<u>Column No.</u>	<u>Variable</u>	<u>Format</u>	<u>Units</u>	<u>Note</u>
7	1-65/1-60	A(I,J)	25(13F5.1/ 12F5.1)	degrees	Wind directions applicable at the next hour; input sequence: (A(I,J), I=1,25), J=1,25)

Include a complete set of Card No. 5-7 for each hour of meteorological data.

Note: Mixing depths are assigned on the hour (0500, 0600, and etc.), and wind speeds and wind directions are applicable from the half hour to the half hour (0430-0530, 0530-0630, and etc.). TSTART must be assigned an even hour, such as 0500 hours.

An important change the user may wish to make in the APSP involves the formulation of the chemical kinetic mechanism. Rate constants and certain stoichiometric coefficients are input via punched cards, which allows these parameters to be altered without changing the code. We summarize below those sections of the code which are directly affected by the formulation of the kinetic mechanism.

<u>Routine</u>	<u>Card ID</u>	<u>Description</u>
MAIN	APS 06560-06630	Expressions relating the concentrations of the "steady state" species to the concentrations of HC, NO, NO ₂ , and O ₃
MAIN	APS 00920-00950 APS 06710-06890	RATE(L) = rate of reaction of species L $R(I,J) = - \frac{\partial(\text{rate expression for species I})}{\partial(\text{concentration of species J})}$
MAIN BCCONC ICCONC	APS 05520-05530 APS 11490-11540 APS 13200-13250	Initial and boundary concentrations of ozone are determined by assuming that the rate of reaction of ozone, both initially and at the boundary, is equal to zero. Thus, we can write an algebraic expression relating the initial and boundary concentrations of ozone to the initial and boundary concentrations of HC, NO, and NO ₂ .
MAIN ICCONC	APS 04980-05010 APS 02790-02810 APS 13150	Calculations involving the temporal variation of photolysis rate constants.

In order to establish the boundary concentrations aloft correctly, the first set of mixing depths in the MDF must be applicable at the starting time of the airshed simulation.

During the evaluation phase of model development, we found it advantageous to perform a 10 hour simulation in two 5 hour segments. Thus, a simulation for 0500-1500 hours is carried out in two sequential steps: 0500-1000 and 1000-1500 hours. To do this, we have made provisions for restarting the program using the results obtained at the end of a previous simulation as initial conditions. The parameter PUNCH, specified on Card No. 2 of the data-deck (see Table 4), determines whether or not the concentration array, CONC(L,I,J,K), is "dumped" onto a save disc area or tape at the time the program terminates. A program restart is controlled by the parameter RESTRT (see Card No. 2 in Table 4). During the restart procedure the initial concentrations on the grid are established by reading the file containing the last concentrations predicted in the previous run. We note that the restart option should only be used when it is of interest to closely monitor the outcome of a particular simulation.

One of the important features of the APSP is that the user can easily modify the computational grid - both horizontally and vertically. The number of vertical cells (or strata) employed must be at least three,

and up to six can be specified in the present code. Only available storage restrictions limit the present code to a maximum of six levels. As far as the horizontal extent of the grid is concerned, the user defines, as part of the program input, the shape of the modeling area. In Figure 1, we illustrate that portion of the original 25x25 grid actually used during the simulation studies of the Los Angeles airshed.

To obtain the shape of the computational grid, we eliminate a series of consecutive grid squares starting from the left and/or right hand borders. Consider the region illustrated in Figure 1. In row 1, 20 consecutive grid squares, starting from the left hand border, are eliminated from the original 25x25 grid. As another example, 14 consecutive grid squares, starting from the right hand border, are eliminated from row 25. The region designation is made by specifying two arrays, ILEFT(J) and IRIGHT(J), containing the column numbers of the left and right-most cells in row J. The following values of ILEFT and IRIGHT are obtained from Figure 1:

ILEFT(1) = 21	IRIGHT(1) = 25
ILEFT(2) = 20	IRIGHT(2) = 25
ILEFT(25) = 1	IRIGHT(25) = 11

Instantaneous and time-averaged ground level concentrations can be predicted at up to 16 user-selected sites. The x and y-coordinates of each site are input to the program on punched cards, where the center of grid square (I,J) has an x-coordinate of I and a y-coordinate of J. In addition, the name of each station is printed on the ground level concentration maps near its location on the grid (see Figures 3 and 4). The user can also specify up to 8 landmarks. The name of each landmark is printed on the ground level concentration maps as an aid in identifying the location of a particular area of the grid. Four landmarks are illustrated in Figures 3 and 4, including the Pacific Ocean, the Santa Monica Mountains, the San Gabriel Mountains, and Palos Verdes.

Computing System Information

Hardware:

5 - disc areas/tape drives

- | | |
|---|----------|
| a. EDF (required) | FT02F001 |
| b. MDF (required) | FT04F001 |
| c. Scratch-Area (required) | FT08F001 |
| d. Save area where concentrations can be written at the end of a simulation for use as initial conditions in a program restart (optional) | FT03F001 |
| e. Save area where concentrations are located to be used as initial conditions in a program restart (optional). | FT09F001 |
| 1 - card reader | FT05F001 |
| 1 - printer | FT06F001 |
| 1 - card punch | FT07F001 |

Program Size: 304K bytes

CPU time (IBM 370/155):

10 hour CO simulation - 4 minutes

10 hour photochemical simulation involving RHC, URHC, NO, NO₂, O₃,
and CO - 73 minutes

Printed Output:

10 hour CO simulation with instantaneous concentration values
printed once an hour.

- hourly-averaged ground level concentration maps
1 species x 10 hours x 1 page/species hour = 10 pages
- hourly-averaged predictions at monitoring stations
10 hours x 1 page/hour = 10 pages
- instantaneous ground level concentration maps
1 species x 10 hours x 1 page/species hour = 10 pages
- instantaneous concentration profiles above each
station (15 stations)
10 hours x 2 pages/hour = 20 pages
- miscellaneous, including grid specifications, rate
constants, and initial conditions = 4 pages

Total Printed Output = 54 pages

10 hour photochemical simulation (6 species) with instantaneous
concentration values printed once an hour.

- hourly-averaged ground level concentration maps
6 species x 10 hours x 1 page/species hour = 60 pages
- hourly-averaged predictions at monitoring stations
10 hours x 1 page/hour = 10 pages
- instantaneous ground-level concentration maps
6 species x 10 hours x 1 page/species hour = 60 pages
- instantaneous concentration profiles above each
station (15 stations)
10 hours x 3 pages/hour = 30 pages
- miscellaneous, including grid specifications,
rate constants, and initial conditions = 10 pages

Total Printed Output = 170 pages

In Table 4 which follows, we describe in detail the data-deck
setup for the APSP.

TABLE 4
DATA-DECK SETUP FOR THE ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Card No.</u>	<u>Column No.</u>	<u>Variable</u>	<u>Format</u>	<u>Units</u>	<u>Note</u>
1	1-80	NOTE(1)	2(20A4)	--	Two cards of user-supplied alphanumeric information to be printed on program output; input sequence: (NOTE(1), I=1,40)
2	1	PUNCH	L1	--	If PUNCH=.TRUE., then the entire concentration array (CONC) will be dumped onto a peripheral storage area at the end of the simulation. These concentrations can be used for a program restart.
2	2	RESTART	L1	--	If RESTART=.TRUE., then the program restarts using the results obtained in a previous simulation for initial conditions
2	6-10	NOX	I5	--	Number of grid points in x-direction
2	11-15	NOY	I5	--	Number of grid points in y-direction
2	16-20	NOZ	I5	--	Number of grid points in z-direction
2	21-30	DT	F10.0	minute	Initial time step size for the numerical integration

TABLE 4 (Cont'd)
DATA-DECK SETUP FOR THE ATMOSPHERIC POLLUTION SIMULATION PROGRAM

Card No.	Column No.	Variable	Format	Units	Note
2	31-40	DELTA X	F10.0	feet	Grid spacing in x-direction
2	41-50	DELTA Y	F10.0	feet	Grid spacing in y-direction
2	51-60	PRTDT	F10.0	minute	Time interval between instantaneous concentration print-outs
2	61-70	TSTART	F10.0	2400 time	Simulation starting time
2	71-80	TSTOP	F10.0	2400 time	Simulation stopping time
3	1-6	ISPEC(L)	6L1	--	If ISPEC(L)=TRUE., then species L will be simulated $L = \begin{cases} 1 & \text{reactive hydrocarbon} \\ 2 & \text{nitric oxide} \\ 3 & \text{ozone} \\ 4 & \text{nitrogen dioxide} \\ 5 & \text{carbon monoxide} \\ 6 & \text{unreactive hydrocarbon} \end{cases}$ Species 1-5 must <u>all</u> be simulated when performing photochemical calculations; species 5 and/or 6 can be simulated independently; input sequence: (ISPEC(L), L=1,6)
3	7-30	UNIT(L)	6A4	--	Alphanumeric designation of the units to be used on input/output for the concentration of species L. For the above species

TABLE 4 (Cont'd)
DATA-DECK SETUP FOR THE ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Card No.</u>	<u>Column No.</u>	<u>Variable</u>	<u>Format</u>	<u>Units</u>	<u>Note</u>
3	31-60	FACTOR(L)	GF5.1	--	$\text{UNIT(L)} = \begin{cases} L=1, 'PPHM' \\ L=2, 'PPHM' \\ L=3, 'PPHM' \\ L=4, 'PPHM' \\ L=5, 'PPM' \\ L=6, 'PPTM' \end{cases}$ input sequence: (UNIT(L), L=1,6) Conversion factor; must be consistent with UNIT(L) If $\text{UNIT(L)} = \begin{cases} 'PPHM' \\ 'PPTM' \\ 'PPM' \end{cases}$, then $\text{FACTOR(L)} = \begin{cases} 100. \\ 10. \\ 1. \end{cases}$. input sequence: (FACTOR(L), L=1,6) Alphameric designation of the time zone (for Los Angeles, use 'PST') Alphameric designation of the geographical location to be modeled (for example, 'LOS ANGELES AND VICINITY'); input sequence: (REGION(I), I=1,20)
3	61-64	TIMEZN	A4	--	
4	1-80	REGION(I)	20A4	--	

TABLE 4 (Cont'd)
DATA-DECK SETUP FOR THE ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Card No.</u>	<u>Column No.</u>	<u>Variable</u>	<u>Format</u>	<u>Units</u>	<u>Notes</u>
5	1-75	ILEFT(J)	25I3	--	ILEFT defines the left (western) border of the model. ILEFT(J) is the column number of the leftmost cell in row J; input sequence: (ILEFT(J),J=1,N0Y)
6	1-75	IRIGHT(J)	25I3	--	IRIGHT defines the right (eastern) border of the model. IRIGHT(J) is the column number of the rightmost cell in row J; input sequence: (IRIGHT(J),J=1,N0Y)
7	1-3	N0STN	I3	--	Number of stations for which vertical concentration distributions and hourly-averaged ground level concentrations will be calculated and printed
7	4-6	N0LAND	I3	--	Number of landmarks that will be printed on the program output
7	7-9	N0PTS	I3	--	Number of point sources

If N0STN = 0, do NOT include Card No. 8.

If N0STN>0, include one Card No. 8 for each station (I=1,N0STN). Sort all Card No. 8 until YSTN(1) ≥ YSTN(2) ≥ ... ≥ YSTN(N0STN).

TABLE 4 (Cont'd)
DATA-DECK SETUP FOR THE ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Card No.</u>	<u>Column No.</u>	<u>Variable</u>	<u>Format</u>	<u>Units</u>	<u>Note</u>
8	1-20	STNAME(I,J)	5A4	--	Alphameric designation of station I (for example 'DOWNTOWN LA'); input sequence: (STNAME(I,J),J=1,5)
8	21-30	XSTN(I)	F10.0	--	x-coordinate of station I.
8	31-40	YSTN(I)	F10.0	--	y-coordinate of station I.
If NOLAND = , do NOT include Card No. 9.					
If NOLAND>0, include one Card No. 9 for each landmark (I = 1, NOLAND). Sort all Card No. 9 until YLAND(1)>YLAND(2)>...>YLAND(NOLAND).					
9	1-20	LANDMK(I,J)	5A4	--	Alphameric designation of landmark I (for example 'PACIFIC OCEAN'); input sequence: (LANDMK(I,J),J=1,5)
9	21-30	XLAND(I)	F10.0	--	x-coordinate of landmark I
9	31-40	YLAND(I)	F10.0	--	y-coordinate of landmark I
If NOPTS = 0, do NOT include Card No. 10-11.					
If NOPTS>0, include a set of Card No. 10-11 for each point source (I = 1, NOPTS).					
10	1-5	XPTS(I)	F5.0	--	x-coordinate of point source I
10	6-10	YPTS(I)	F5.0	--	y-coordinate of point source I

TABLE 4 (Cont'd)
DATA-DECK SETUP FOR THE ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Card No.</u>	<u>Column No.</u>	<u>Variable</u>	<u>Format</u>	<u>Units</u>	<u>Note</u>
10	11-20	HEMIS(I)	F10.0	feet	Height at which point source I emits pollutants
10	21-80	PTMIS(L,I)	6F10.0	pound-mole/hour	Nominal emissions rate of species L from point source I; input sequence: (PTMIS(L,I), L=1,6)
11	1-80	TEMPTS(I,J)	3(8F10.0)	--	Temporal distribution for point source I; fraction of nominal emissions rate, PTMIS(L,I), during hourly period J. PTMIS(L,I)*TEMPTS(I,J) = emissions rate of species L from point source I during hourly period J; input sequence: (TEMPTS(I,J), J=1,24)
12	1-5	MAXITR	I5	--	Maximum number of iterations allowed in the Newton solution of the nonlinear difference equations
12	6-10	ERROR	F5.0	--	Relative error tolerance that must be satisfied before the Newton iteration is considered finished
12	11-15	DTMIN	F5.0	Minute	Minimum allowable integration time step. If the program must take a smaller step, it terminates.
12	16-20	DTMAX	F5.0	Minute	Maximum allowable integration time step

TABLE 4 (Cont'd)
DATA-DECK SETUP FOR THE ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Card No.</u>	<u>Column No.</u>	<u>Variable</u>	<u>Format</u>	<u>Units</u>	<u>Note</u>
12	21-25	ALPHA	F5.0	--	Chemical kinetics parameter
12	26-30	BETA	F5.0	--	Chemical kinetics parameter
12	31-35	GAMMA	F5.0	--	Chemical kinetics parameter
12	36-40	EPS	F5.0	--	Chemical kinetics parameter
12	41-45	HTOP	F5.0	feet	Height above which the ambient concentration above the inversion base is CALOFT (see Card No. 16)
13	1-80	RKO(I)	(8F10.0)	ppm-min	Nominal chemical reaction rate constant for reaction I; input sequence: (RKO(I), I=1, NORATE) NORATE = number of chemical reactions (this parameter is defined in the MAIN program)
14	1-80	FACTRK(J)	3(8F10.0)	--	Light intensity curve, fraction of nominal photolysis rate constant (k_1, k_7) at hour J (J=1 corresponds to midnight) $k_1 = RKO(1) * FACTRK(J)$ at hour J; input sequence: (FACTRK(J), J=1, 24)

TABLE 4 (Cont'd)
DATA-DECK SETUP FOR THE ATMOSPHERIC POLLUTION SIMULATION PROGRAM

Card No.	Column No.	Variable	Format	Units	Note
15	1-24	NAME(L)	6A4	--	Alphanumeric designation of the name of species L
		$NAME(L) = \begin{cases} L=1, & \text{'HC'} \\ L=2, & \text{'NO'} \\ L=3, & \text{'O3'} \\ L=4, & \text{'NO2'} \\ L=5, & \text{'CO'} \\ L=6, & \text{'URHC'} \end{cases}$			
		input sequence: (NAME(L), L=1,6)			
16	1-75	CALOFT(L,I,J)	(25F3.0) (see note)	see note	Ambient concentration aloft of species L above grid square (I,J). These concentrations apply when the mixing depth above grid square (I,J) is greater than HTOP (see Card No. 12).

The concentration units are the same as those designated by UNIT(L) (see Card No. 3). The input sequence is governed by the following logic:

```
DO 3 L=1,NOSPEC
  IF(.NOT.ISPEC(L)) GO TO 3
  DO 1 J=1,NOY
    1 READ(5,2) (CALOFT(L,I,J),
      11=1,NOX)
    2 FORMAT(25F3.0)
    3 CONTINUE
```

Note that input cards are included only for those species simulated.

TABLE 4 (Cont'd)
DATA-DECK SETUP FOR THE ATMOSPHERIC POLLUTION SIMULATION PROGRAM

Card No.	Column No.	Variable	Format	Units	Note
17	1-75	CONCI(L,I,J)	25F3.0 (see note)	see note	Initial ground level concentration of species I in grid cell (I,J,1). The concentration units are the same as those designated by UNIT(L) (see Card No. 3). The input sequence is governed by the same logic as that used for the input of CALOFT(L,I,J) (see Card No. 16). No cards are included for those species not being simulated.

Include a sufficient number of sets of Card No. 18-19 to cover the entire time period to be simulated (i.e., TSTART to TSTOP-see Card No. 2). The sets of Card No. 18-19 should be arranged sequentially, according to the time interval designated by TDATA and TNEXT. For example, consider the following sequence:

Set #1	{ Card No. 18 - TDATA = 0500, TNEXT = 0600. Card No. 19 - Boundary conditions that apply between 0500 and 0600.				
Set #2	{ Card No. 18 - TDATA = 0600, TNEXT = 0700. Card No. 19 - Boundary conditions that apply between 0600 and 0700				
18	1-10	TDATA	F10.0	2400 time	Beginning of the time interval over which the following boundary conditions hold.
18	11-20	TNEXT	F10.0	2400 time	End of the time interval over which the following boundary conditions hold.

TABLE 4 (Cont'd)
DATA-DECK SETUP FOR THE ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Card No.</u>	<u>Column No.</u>	<u>Variable</u>	<u>Format</u>	<u>Units</u>	<u>Note</u>
19	1-75	BC(L,I,J)	25F3.0 (see note)	see note	Boundary concentrations for species L at points of horizontal inflow to the model. I denotes the row (east or west border) or column (north or south border) number of the boundary cell on border J.

$J = \begin{Bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{Bmatrix}$ refers to the

$\begin{Bmatrix} \text{top} & (\text{north}) \\ \text{bottom} & (\text{south}) \\ \text{right} & (\text{east}) \\ \text{left} & (\text{west}) \end{Bmatrix}$ border

The concentration units are the same as those designated by UNIT(L) (see Card No. 3). The input sequence is governed by the following logic:

```
DO 3 L=1,NOSPEC
IF(.NOT.ISPEC(L))GO TO 3
ISTOP=NOX
DO 1 J=1,4
IF(J.GT.2) ISTOP=NOY
```

```
1 READ(5,2) (BC(L,I,J),I=1,
1 ISTOP)
2 FORMAT(25F3.0)
3 CONTINUE
```

Note that input cards are included only for those species simulated.

4. The Data Plotting Program

We summarise below the changes that may be required in the code of the DPP.

- The NO measurements at stations 5 and 9 (El Monte and Commerce) are not corrected. To make corrections at these stations, remove card DPP 1920.
- Oxidant measurements are not corrected at stations 5 and 9 (El Monte and Commerce). To make oxidant corrections at these stations, remove card DPP 2000.
- Oxidant measurements are not corrected at station number 13 (Long Beach). To correct oxidant measurements at this station, remove card DPP 1990.

The following limitations are placed on the use of the DPP:

- Only local corrections to CO predictions will be plotted
- No more than 12 hours of data can be plotted

Computing System Information

Hardware:

1 - card reader	FT05F001
1 - printer	FT06F001
1 - Calcomp Plotter	

Program Size: 68K bytes

CPU Time (IBM 370/155): 30 seconds

Printed Output: 1 page

Software:

The following Calcomp routines are used in the DPP. All coordinates and heights are measured in inches.

SYSPLT(X,Y,IPN)

This routine moves the pen from its present location to (X,Y) with the pen up (IPN=3) or down (IPN=2).

SYSSYM(X,Y,H,SYMBOL,N,DEG)

This routine plots the alphanumeric information contained in SYMBOL at the point (X,Y). The height of the plotting is H, and the plot is produced at an angle of DEG with respect to the x-axis. The number of symbols to be plotted is N.

SYSEND(LAB,FLAG)

This routine is used to terminate a plot with or without plotting the page number at the lower-right corner of the paper.

LAB	{	= 0, the pen will return to the current origin without plotting a page number.
		> 0, the page number is plotted. Then the pen is moved to the next origin.
		< 0, the pen is moved to the next origin without plotting the page number.
FLAG	{	≠ 0, the statements "ONE SHEET PLOTTED" and "ENDING PLOT LABELED..." will be printed on user's output.
		= 0, the above printing will be suppressed.

The data-deck setup for the DPP is described in Table 5.

TABLE 5
DATA-DECK SETUP FOR THE DATA PLOTTING PROGRAM

Card No.	Column No.	Variable	Format	Units	Note
1	1-5	NOSTN	I5	--	Number of monitoring stations
1	6-10	NOHOUR	I5	--	Number of hours simulated
1	11-20	TSTART	F10.0	2400 time	Simulation starting time
1	21-30	CARHHC	F10.0	--	Number of carbon atoms per molecule of reactive hydrocarbon
1	31-40	CARUHC	F10.0	--	Number of carbon atoms per molecule of unreactive hydrocarbon
1	41-48	DATE(I)	2A4	--	Alphanumeric designation of the date - for example, '9/29/69'; input sequence: (DATE(I), I=1,2)
2	1-20	STNAME(L,K)	5A4	--	20 columns of alphanumeric information designating the name or location of monitoring station K; input sequence: (STNAME(L,K), L=1,5)
2	21-26	PLSPEC (K,L)	6L1	--	If PLSPEC(K,L)=.TRUE., then plot species L at monitoring station K; input sequence: (PLSPEC(K,L), L=1,6)

Include a Card No. 2 for each monitoring station (K=1,NOSTN); be certain station K corresponds to station number K in the Atmospheric Pollution Simulation Program.

TABLE 5 (Cont'd)
DATA-DECK SETUP FOR THE DATA PLOTTING PROGRAM

Card No.	Column No.	Variable	Format	Units	Note
Include a Card No. 3 for each monitoring station reporting and each chemical species measured. The cards may be in any order; columns 7-9 should be left blank on all cards EXCEPT the last one, on which a "T" must be punched somewhere in columns 7-9.					
3	7-9	LAST	L3	--	If LAST=.TRUE., then the present card is the last Card No. 3 in the data-deck
3	10-11	ISTN	I2	--	Monitoring station number
3	12-13	ISPEC	I2	--	Chemical species number $\text{ISPEC} = \begin{cases} 1 \text{ SO}_2 & (\text{pphm}) \\ 2 \text{ NO} & (\text{pphm}) \\ 3 \text{ O}_3 & (\text{pphm}) \\ 4 \text{ NO}_2 & (\text{pphm}) \\ 5 \text{ CO} & (\text{ppm}) \\ 6 \text{ total HC} & (\text{ppmC}) \end{cases}$
3	33-80	DATA(I)	24F2.0	--	Measured hourly-averaged pollutant concentrations starting at midnight (see ISPEC above for units); input sequence: (DATA(I), I=1,24)
Include a Card No. 4 for each station and each chemical species for which a local correction is to be made; columns 1-3 should be left blank on all cards EXCEPT the last one, on which a "T" must be punched somewhere in columns 1-3.					
4	1-3	LAST	L3	--	If LAST=.TRUE., then the present card is the last Card No. 4 in the data-deck

TABLE 5 (Cont'd)
DATA-DECK SETUP FOR THE DATA PLOTTING PROGRAM

Card No.	Column No.	Variable	Format	Units	Note
4	4-6	ISTN	I3	--	Monitoring station number
4	7-9	ISPEC	I3	--	Chemical species number $\text{ISPEC} = \begin{cases} 1 & \text{reactive hydrocarbon (pphm)} \\ 2 & \text{NO (pphm)} \\ 3 & \text{O}_3 \text{ (pphm)} \\ 4 & \text{NO}_2 \text{ (pphm)} \\ 5 & \text{CO (ppm)} \\ 6 & \text{unreactive hydrocarbon (pptm)} \end{cases}$
4	10-45	STCORR(ISTN,ISPEC,I)	12F3.0	--	Local correction to be applied to the model prediction at station ISTN for species ISPEC at hour I; I=1 corresponds to the hourly average starting at TSTART (see Card No. 1); see ISPEC above for the concentration units; input sequence: (STCORR(ISTN,ISPEC,I),I=1,NOHOUR)

Include a Card No. 5 for each chemical species and each hour simulated. The cards may be in any order. These cards are punched by the Atmospheric Pollution Simulation Program.

5	5-10	ISPEC	I6	--	Chemical species number
5	11-16	T1	F6.0	2400 time	Hour the model predictions were averaged over
5	17-80	A(I)	16F4.0	--	Concentration of species ISPEC predicted at monitoring site I over hour T1; input sequence: (A(I),I=1,NOSTN)

IV. LISTINGS, SYMBOL GLOSSARIES, AND SAMPLE OUTPUT

In this section we include the listing, symbol glossary, and sample output for each computer program.

```

*****EDPP0010
C*      THE EMISSIONS DATA PREPARATION PROGRAM      *EDPP0020
C*                                                    *EDPP0030
C*                                                    *EDPP0040
C*                                                    *EDPP0050
C*      WRITTEN BY: STEVEN D. REYNOLDS              *EDPP0060
C*                                                    *EDPP0070
C*      FOR                                           *EDPP0080
C*                                                    *EDPP0090
C*      SYSTEMS APPLICATIONS, INC.                  *EDPP0100
C*      9418 WILSHIRE BLVD.                         *EDPP0110
C*      BEVERLY HILLS, CALIFORNIA 90212             *EDPP0120
C*                                                    *EDPP0130
C*                                                    *EDPP0140
C*      JCL INFORMATION                             *EDPP0150
C*                                                    *EDPP0160
C*      FT04F001      EMISSIONS DATA FILE          *EDPP0170
C*      FT05F001      CARD READER                  *EDPP0180
C*      FT06F001      PRINTER                      *EDPP0190
C*                                                    *EDPP0200
C*      THE EMISSIONS DATA FILE IS DEFINED AS FOLLOWS (USING A 9 *EDPP0210
C*      TRACK, 1600 BPI TAPE) 1                     *EDPP0220
C*                                                    *EDPP0230
C*FT04F001 DD UNIT=(TAPE16,,DEFER),LABEL=(1,BLP),DISP=(OLD,KEEP), *EDPP0240
C*      VOL=SER=EDF001,DCB=(RECFM=VS,LRECL=2504,BLKSIZE=2508) *EDPP0250
C*                                                    *EDPP0260
C*****EDPP0270
C*      DIMENSION EC(3),EH(3),XA(3),TSURF(24),TFREE(24),SURMLG(25,25),FWYME *EDPP0280
C*      1LG(25,25),BETA(6,5,12),VS(25,25),VF(25,25),VSI(25,25),VF1(25,25), *EDPP0290
C*      1 SMILES(25,25),FMI1E8(25,25),E(3,25,25),X(25,25),Q1(6,25,25), *EDPP0300
C*      1 Q2(6,25,25),QSLOPE(25,25),XMOL(6),XB(3) *EDPP0310
C*      DIMENSION FXSDUR(25,25,6),FACTFS(6),AIRFLX(6,60),YCS(24) *EDPP0320
C*      DATA XMOL/47,8,30,,48,,46,,28,,21.1 / *EDPP0330
C*      COMMON/AIRCFT/NOARPT,NCORT(15),EMIX(15,7),ACFT(15,7),PCT(15,4), *EDPP0340
C*      1 DIST(15,24),IXORT(15,4),IYORT(15,4),TMODE(3,7),AIREMS(3,6,7) *EDPP0350
C*      REAL NAME(6),WTF8(6) *EDPP0360
C*      DATA WTF8/60,,30,,48,,46,,28,,18./ *EDPP0370
C*      DATA NAME/4H HC ,4H NO ,4H O3 ,4H NO2,4H CO ,4HURHC/ *EDPP0380
C*      LOGICAL KFLAG,PDT *EDPP0390
C*      KFLAG=.FALSE. *EDPP0400
C*      DX=10560, *EDPP0410
C*      DY=10560, *EDPP0420
C*                                                    *EDPP0430
C*      *** DEFINE MOLE FRACTIONS OF NO AND REACTIVE HYDROCARBON IN *EDPP0440
C*      TOTAL NOX AND HYDROCARBON EMISSIONS *EDPP0450
C*                                                    *EDPP0460
C*      FAIRNO=0.99 *EDPP0470
C*      FCARHC=0.674 *EDPP0480
C*      FCARNO=0.99 *EDPP0490
C*      FFSNO=0.98 *EDPP0500
C*                                                    *EDPP0510
C*      *** COMPUTE THE MASS FRACTION OF NO AND REACTIVE HYDROCARBON *EDPP0520
C*      IN TOTAL NOX AND HYDROCARBON EMISSIONS *EDPP0530
C*                                                    *EDPP0540
C*      XCARHC=FCARHC*XMOL(1)/(FCARHC*XMOL(1) + (1.-FCARHC)*XMOL(6)) *EDPP0550
C*      XAIRNO=FAIRNO*XMOL(2)/(FAIRNO*XMOL(2) + (1.-FAIRNO)*XMOL(4)) *EDPP0560
C*      XCARNO=FCARNO*XMOL(2)/(FCARNO*XMOL(2) + (1.-FCARNO)*XMOL(4)) *EDPP0570
C*      XFSNO=FFSNO*WTF8(2)/(FFSNO*WTF8(2) + (1.-FFSNO)*WTF8(4)) *EDPP0580
C*      HCEVAP=67.6 *EDPP0590
C*      DENCAR=46./30. + (1.-XCARNO)/XCARNO *EDPP0600

```

```

DENAIR=XAIRNO*46./30. + 1.-XAIRNO
DENFS=46./30. + (1.-XFSNO)/XFSNO
FACTEV=0.343*8.68E5/(60.*HCEVAP*DX*DY)

```

```

*** INPUT CARD NO. 1-7

```

```

READ(5,900) YC8
READ(5,901) EC,PDT
READ(5,900) EM
READ(5,900) XA
READ(5,900) XB
READ(5,900) TSURF
READ(5,900) TFREE
900 FORMAT(8F10.0)
901 FORMAT(3F10.0,L1)

```

```

*** ESTABLISH STARTING TIME

```

```

TDATA=455.
TNEXT=500.
IF(.NOT.PDT) GO TO 902
TDATA=355.
TNEXT=400.
902 CONTINUE
DO 699 L=1,24
TSURF(L)=TSURF(L)*1.0E-4
699 TFREE(L)=TFREE(L)*1.0E-4

```

```

*** INPUT CARD NO. 8 AND 9

```

```

READ(5,100) SURMLG,FWYMLG
100 FORMAT(25F3.0)

```

```

*** CONVERT FROM THOUSANDS OF MILES TO MILES

```

```

DO 101 I=1,25
DO 101 J=1,25
SURMLG(I,J)=SURMLG(I,J)*1000
101 FWYMLG(I,J)=FWYMLG(I,J)*1000

```

```

*** INPUT CARD NO. 10-14

```

```

READ(5,400) (((BETA(M,L,K),K=1,12),L=1,5),M=1,3)
400 FORMAT(12F6.3)
READ(5,300) V81,VF1
300 FORMAT(13F5.0/12F5.0)
READ(5,300) FX8OUR
READ(5,11) NOARPT
IF(NOARPT.LE.0) GO TO 13

```

```

*** INPUT CARD NO. 15-16

```

```

READ(5,10) (((AIREMS(M,L,I),I=1,7),L=1,6),M=1,3)
READ(5,10) ((TMODE(M,I),I=1,7),M=1,3)
10 FORMAT(7F10.1)
11 FORMAT(I5)

```

```

*** INPUT CARD NO. 17-23 FOR EACH AIRPORT

```

```

DO 12 J=1,NOARPT

```

```

EDPP0610
EDPP0620
EDPP0630
EDPP0640
EDPP0650
EDPP0660
EDPP0670
EDPP0680
EDPP0690
EDPP0700
EDPP0710
EDPP0720
EDPP0730
EDPP0740
EDPP0750
EDPP0760
EDPP0770
EDPP0780
EDPP0790
EDPP0800
EDPP0810
EDPP0820
EDPP0830
EDPP0840
EDPP0850
EDPP0860
EDPP0870
EDPP0880
EDPP0890
EDPP0900
EDPP0910
EDPP0920
EDPP0930
EDPP0940
EDPP0950
EDPP0960
EDPP0970
EDPP0980
EDPP0990
EDPP1000
EDPP1010
EDPP1020
EDPP1030
EDPP1040
EDPP1050
EDPP1060
EDPP1070
EDPP1080
EDPP1090
EDPP1100
EDPP1110
EDPP1120
EDPP1130
EDPP1140
EDPP1150
EDPP1160
EDPP1170
EDPP1180
EDPP1190
EDPP1200

```


	READ(5,17) AIRPRT,NCORT(J)	EDPP1210
	M=NCORT(J)	EDPP1220
	READ(5,16) (IXORT(J,I),I=1,M)	EDPP1230
	READ(5,16) (IYORT(J,I),I=1,M)	EDPP1240
	READ(5,19) (DIST(J,I),I=1,24)	EDPP1250
	READ(5,15) (PCT(J,I),I=1,M)	EDPP1260
	READ(5,15) (ACFT(J,I),I=1,7)	EDPP1270
	READ(5,15) (EMIX(J,I),I=1,7)	EDPP1280
15	FORMAT(13F6,2)	EDPP1290
16	FORMAT(6I5)	EDPP1300
19	FORMAT(12F5,3)	EDPP1310
17	FORMAT(A4,I2)	EDPP1320
12	CONTINUE	EDPP1330
13	CONTINUE	EDPP1340
C		EDPP1350
C	*** CONVERT FIXED SOURCE EMISSIONS INTO A SURFACE FLUX WITH	EDPP1360
C	THE UNITS PPM=FEET/MINUTE	EDPP1370
	DO 14 L=1,6	EDPP1380
14	FACTFS(L)=1000,*8.680E5/(WTF5(L)*60,*DX*DY)	EDPP1390
	FACTFS(2)=FACTFS(2)/DENFS	EDPP1400
	FACTFS(4)=FACTFS(4)*(1.0-XFSND)/(XFSND*DENFS)	EDPP1410
	DO 105 L=1,6	EDPP1420
	DO 105 I=1,25	EDPP1430
	DO 105 J=1,25	EDPP1440
105	FXSOUR(I,J,L)=FXSOUR(I,J,L)*FACTFS(L)	EDPP1450
C		EDPP1460
C	*** CALCULATE TOTAL POLLUTANT FLUX EMITTED FROM EACH AIRPORT	EDPP1470
C		EDPP1480
	IF(NOARPT,LE,0) GO TO 50	EDPP1490
	DO 36 L=1,6	EDPP1500
	DO 35 J=1,NOARPT	EDPP1510
	FLUX=0.	EDPP1520
	DO 37 I=1,7	EDPP1530
37	FLUX=FLUX + ACFT(J,I)*EMIX(J,I)*(AIREMS(1,L,I)*TMODE(1,I) + AIREMS(2,L,I)*TMODE(2,I) + AIREMS(3,L,I)*TMODE(3,I))	EDPP1540
	AIRFLX(L,J)=FLUX*1.0E-3*394.0*1.0E6/(60,*XMOL(L)*DX*DY)	EDPP1550
	IF(L,EQ,2,OR,L,EQ,4)AIRFLX(L,J)=AIRFLX(L,J)/DENAIR	EDPP1560
35	CONTINUE	EDPP1570
36	CONTINUE	EDPP1580
C		EDPP1590
C	*** IN THE NEXT SECTION OF CODE, EMISSIONS ARE CALCULATED FOR	EDPP1600
C	EACH FIVE MINUTE INTERVAL BETWEEN 0500 AND 0955 HOURS	EDPP1610
C	LOCAL TIME	EDPP1620
50	DO 1 LL=1,5	EDPP1630
C		EDPP1640
C	*** SET PARAMETERS CONTROLLING THE TEMPORAL DISTRIBUTION OF	EDPP1650
C	FIXED SOURCE EMISSIONS AND EVAPORATIVE EMISSIONS FROM	EDPP1660
C	AUTOMOBILES	EDPP1670
C		EDPP1680
	LM=0	EDPP1690
	LN=0	EDPP1700
	IF(LL,GT,1) LM=1	EDPP1710
	IF(LL,GT,2) LN=1	EDPP1720
C		EDPP1730
C	*** CALCULATE THE NUMBER OF MILES DRIVEN ON SURFACE STREETS	EDPP1740
	AND FREEWAYS	EDPP1750
	DO 450 I=1,25	EDPP1760
		EDPP1770
		EDPP1780
		EDPP1790
		EDPP1800

	DO 450 J=1,25	EDPP1810
	V8(I,J)=V81(I,J)	EDPP1820
	VF(I,J)=VF1(I,J)	EDPP1830
	LO=LL	EDPP1840
C		EDPP1850
C	*** SHIFT THE TEMPORAL DISTRIBUTION OF TRAFFIC ACTIVITY IN THE	EDPP1860
C	DOWNTOWN LOS ANGELES AREA BACK BY ONE HOUR	EDPP1870
C		EDPP1880
	IF(I,EQ,11,AND,J,EQ,17) LO=LL-1	EDPP1890
	IF(I,EQ,12,AND,J,EQ,17) LO=LL-1	EDPP1900
	IF(I,EQ,12,AND,J,EQ,16) LO=LL-1	EDPP1910
	SMILES(I,J)=8URMLG(I,J)*TSURF(LO+5)	EDPP1920
450	PMILES(I,J)=FWYMLG(I,J)*TFREE(LO+5)	EDPP1930
C		EDPP1940
C	*** INPUT CARD NO. 24=26	EDPP1950
C		EDPP1960
	READ (5,300)((X(I,J),I=1,25),J=1,25)	EDPP1970
	READ (5,300)((V81(I,J),I=1,25),J=1,25),((VF1(I,J),I=1,25),J=1,25)	EDPP1980
C		EDPP1990
C	*** DO LOOP FOR EACH FIVE MINUTES IN THE HOUR	EDPP2000
C		EDPP2010
	DO 111 K=1,12	EDPP2020
	XK=FLOAT(K=1)/12.	EDPP2030
C		EDPP2040
C	*** CALCULATE TOTAL EMISSIONS FROM AUTOMOBILES IN EACH GRID	EDPP2050
C	SQUARE	EDPP2060
C		EDPP2070
	DO 120 I=1,25	EDPP2080
	DO 120 J=1,25	EDPP2090
	VSS=VS(I,J)+(V81(I,J)+VS(I,J))*XK	EDPP2100
	VFF=VF(I,J)+(VF1(I,J)+VF(I,J))*XK	EDPP2110
	DO 120 M=1,3	EDPP2120
	IF(VSS,EQ,0.) GO TO 550	EDPP2130
	ALS=VSS**XB(M)	EDPP2140
	ALF=VFF**XB(M)	EDPP2150
	GO TO 551	EDPP2160
550	ALS=0.	EDPP2170
	ALF=0.	EDPP2180
551	CONTINUE	EDPP2190
	E(M ,I,J)=XA(M)*PMILES(I,J)*(ALF+X(I,J)*ALS)/(1.+X(I,J))+	EDPP2200
	1 BETA(M,LL,K)*(YCS(LL+5)*EC(M)+(1.-YCS(LL+5))*EH(M))*SMILES(I,J)	EDPP2210
120	CONTINUE	EDPP2220
C		EDPP2230
C	*** CONVERT AUTOMOTIVE EMISSIONS (MASS/TIME) TO A FLUX BASED	EDPP2240
C	ON THE AREA OF A GRID SQUARE. THIS IS A PARTIAL CONVERSION	EDPP2250
C	OF THE UNITS TO PPM=FEET/MINUTE. THE REMAINDER OF THE	EDPP2260
C	CONVERSION TAKES PLACE IN THE NEXT SECTION OF CODE.	EDPP2270
C		EDPP2280
	DO 330 L=1,3	EDPP2290
	DO 330 I=1,25	EDPP2300
	DO 330 J=1,25	EDPP2310
330	E(L,I,J)=E(L,I,J) *8.680E5/(DX*DY)	EDPP2320
C		EDPP2330
C	*** COMPLETE THE CONVERSION OF THE AUTOMOTIVE FLUX TO PPM=	EDPP2340
C	FEET/MINUTE AND COMBINE WITH THE FIXED SOURCE FLUX	EDPP2350
C		EDPP2360
	DO 331 I=1,25	EDPP2370
	DO 331 J=1,25	EDPP2380
	Q2(I,I,J)=E(2,I,J)*XCARMC/XMOL(1)+FXSOUR(I,J,1)*LM+LN*FACTEV*8URML	EDPP2390
	1G(I,J)	EDPP2400

	Q2(2,I,J)=E(3,I,J)/(XMOL(2)*DENCAR) + FXSOUR(I,J,2)*LM	EDPP2410
	Q2(3,I,J)=0,	EDPP2420
	Q2(4,I,J)=E(3,I,J)*(1,-XCARNO)/(XMOL(4)*XCARNO*DENCAR) +	EDPP2430
	1 FXSOUR(I,J,4)*LM	EDPP2440
	Q2(5,I,J)=E(1,I,J)/XMOL(5) + FXSOUR(I,J,5)*LM	EDPP2450
331	Q2(6,I,J)=E(2,I,J)*(1,-XCARHC)/XMOL(6) + FXSOUR(I,J,6)*LM	EDPP2460
C		EDPP2470
C	*** ADD EMISSIONS FLUXES FROM AIRPORTS	EDPP2480
C		EDPP2490
	IF(NOARPT,LE,0) GO TO 55	EDPP2500
	DO 40 J=1,NOARPT	EDPP2510
	M=NCORT(J)	EDPP2520
	DO 41 II=1,M	EDPP2530
	DO 336 L=1,6	EDPP2540
336	Q2(L,IXORT(J,II),IYORT(J,II))=Q2(L,IXORT(J,II),IYORT(J,II)) + PCT(	EDPP2550
	1J, II)*DIST(J,LL+5)*AIRFLX(L,J)	EDPP2560
41	CONTINUE	EDPP2570
40	CONTINUE	EDPP2580
55	CONTINUE	EDPP2590
	IF(KFLAG) GO TO 88	EDPP2600
C		EDPP2610
C	*** WRITE THE INITIAL EMISSIONS FLUXES ON THE FILE	EDPP2620
C		EDPP2630
	KFLAG=.TRUE.	EDPP2640
	DO 86 L=1,6	EDPP2650
	WRITE(4) ((Q2(L,I,J),I=1,25),J=1,25)	EDPP2660
86	CONTINUE	EDPP2670
	GO TO 92	EDPP2680
C		EDPP2690
C	*** DEFINE AND WRITE THE TIME INTERVAL ON THE FILE	EDPP2700
C		EDPP2710
88	TDATA=TIME(TDATA,5,,1)	EDPP2720
	TNEXT=TIME(TNEXT,5,,1)	EDPP2730
	WRITE(4) TDATA,TNEXT	EDPP2740
C		EDPP2750
C	*** CALCULATE THE TIME RATE OF CHANGE OF THE EMISSIONS FLUXES	EDPP2760
C	AND WRITE THEM ON THE FILE	EDPP2770
C		EDPP2780
	DO 91 L=1,6	EDPP2790
	DO 90 J=1,25	EDPP2800
	DO 90 I=1,25	EDPP2810
90	QSLOPE(I,J)=(Q2(L,I,J)-Q1(L,I,J))/5.	EDPP2820
91	WRITE(4) QSLOPE	EDPP2830
92	DO 554 L=1,6	EDPP2840
	DO 554 I=1,25	EDPP2850
	DO 554 J=1,25	EDPP2860
554	Q1(L,I,J)=Q2(L,I,J)	EDPP2870
111	CONTINUE	EDPP2880
	1 CONTINUE	EDPP2890
C		EDPP2900
C	*** IN THE NEXT SECTION OF THE CODE, EMISSIONS ARE CALCULATED	EDPP2910
C	HOURLY	EDPP2920
C		EDPP2930
	DO 3 LL=6,12	EDPP2940
C		EDPP2950
C	*** COMPUTE AUTOMOTIVE EMISSIONS FLUXES	EDPP2960
C		EDPP2970
	DO 2 M=1,3	EDPP2980
	DO 2 I=1,25	EDPP2990
	DO 2 J=1,25	EDPP3000

	LO=LL	EDPP3010
C		EDPP3020
C	*** SHIFT TEMPORAL DISTRIBUTION OF AUTOMOBILE TRAFFIC ACTIVITY	EQPP3030
C	IN THE DOWNTOWN LOS ANGELES AREA BACK BY ONE HOUR	EDPP3040
C		EDPP3050
	IF(I,EQ,11,AND,J,EQ,17) LO=LL-1	EDPP3060
	IF(I,EQ,12,AND,J,EQ,17) LO=LL-1	EDPP3070
	IF(I,EQ,12,AND,J,EQ,16) LO=LL-1	EDPP3080
	SMILES(I,J)=SURMLG(I,J)*TSURF(LO+5)	EDPP3090
	FMILES(I,J)=FWYMLG(I,J)*TFREE(LO+5)	EDPP3100
	E(M,I,J)=SMILES(I,J)*(YCS(LL+5)*EC(M)+(1,-YCS	EDPP3110
	1 LL+5))*EH(M)) + FMILES(I,J)*XA(M)*(60,**XB(M))	EDPP3120
2	E(M,I,J)=E(M,I,J)*8.680E5/(DX*DY)	EDPP3130
C		EDPP3140
C	*** ADD FIXED SOURCE EMISSIONS FLUXES TO AUTOMOTIVE FLUXES	EDPP3150
C		EDPP3160
	DO 631 I=1,25	EDPP3170
	DO 631 J=1,25	EDPP3180
	Q2(1,I,J)=E(2,I,J)*XCARHC/XMOL(1)+FXSOUR(I,J,1)+FACTEV*SURMLG(I,J)	EDPP3190
	Q2(2,I,J)=E(3,I,J)/(XMOL(2)*DENCAR) + FXSOUR(I,J,2)*LM	EDPP3200
	Q2(3,I,J)=0.	EDPP3210
	Q2(4,I,J)=E(3,I,J)*(1,-XCARN0)/(XMOL(4)*XCARN0*DENCAR) +	EDPP3220
	1 FXSOUR(I,J,4)*LM	EDPP3230
	Q2(5,I,J)=E(1,I,J)/XMOL(5) + FXSOUR(I,J,5)	EDPP3240
631	Q2(6,I,J)=E(2,I,J)*(1,-XCARHC)/XMOL(6) + FXSOUR(I,J,6)	EDPP3250
C		EDPP3260
C	*** ADD FLUXES FROM AIRPORTS	EDPP3270
C		EDPP3280
	IF(NOARPT,LE,0) GO TO 655	EDPP3290
	DO 640 J=1,NOARPT	EDPP3300
	M=NCORT(J)	EDPP3310
	DO 641 L=1,6	EDPP3320
	DO 641 II=1,M	EDPP3330
641	Q2(L,IXORT(J,II),IYORT(J,II))=Q2(L,IXORT(J,II),IYORT(J,II)) + PCT	EDPP3340
	1J, II)*DIST(J,LL+5)*AIRFLX(L,J)	EDPP3350
640	CONTINUE	EDPP3360
655	CONTINUE	EDPP3370
C		EDPP3380
C	*** DEFINE AND WRITE ON THE FILE THE TIME INTERVAL CORRESPONDING	EDPP3390
C	TO THE LAST FIVE MINUTES OF THE HOUR (I.E., 0955-1000	EDPP3400
C	HOURS, 1055-1100 HOURS, AND ETC.)	EDPP3410
C		EDPP3420
	TDATA=TNEXT	EDPP3430
	TNEXT=TIME(TDATA,5.,1)	EDPP3440
	WRITE(4) TDATA,TNEXT	EDPP3450
C		EDPP3460
C	*** CALCULATE THE TIME RATE OF CHANGE OF THE EMISSIONS FLUXES	EDPP3470
C	OVER THE LAST FIVE MINUTES OF THE HOUR, AND WRITE THEM ON	EDPP3480
C	THE FILE	EDPP3490
C		EDPP3500
	DO 691 L=1,6	EDPP3510
	DO 690 I=1,25	EDPP3520
	DO 690 J=1,25	EDPP3530
690	QSLOPE(I,J)=(Q2(L,I,J)-Q1(L,I,J))/5.	EDPP3540
691	WRITE(4) QSLOPE	EDPP3550
C		EDPP3560
C	*** DEFINE AND WRITE ON THE FILE THE TIME INTERVAL CORRESPONDING	EDPP3570
C	TO THE FIRST 55 MINUTES OF THE HOUR (I.E., 1000-1055 HOURS,	EDPP3580
C	1100-1155 HOURS, AND ETC.)	EDPP3590
C		EDPP3600

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E0PP3610
E0PP3620
E0PP3630
E0PP3640
E0PP3650
E0PP3660
E0PP3670
E0PP3680
E0PP3690
E0PP3700
E0PP3710
E0PP3720
E0PP3730
E0PP3740
E0PP3750
E0PP3760
E0PP3770
E0PP3780
E0PP3790
E0PP3800
E0PP3810
E0PP3820
E0PP3830
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E0PP3850
E0PP3860
E0PP3870
E0PP3880
E0PP3890
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E0PP3930
E0PP3940
E0PP3950
E0PP3960
E0PP3970
E0PP3980
E0PP3990
E0PP4000
E0PP4010
E0PP4020
E0PP4030
E0PP4040
E0PP4050
E0PP4060
E0PP4070
E0PP4080
E0PP4090
E0PP4100
E0PP4110
E0PP4120
E0PP4130
E0PP4140
E0PP4150
E0PP4160

REAL FUNCTION TIME(T1,T2,M)
GO TO (1,2,3),M

*** ADD A TIME IN MINUTES TO A 2400 HOUR TIME AND RETURN A 2400
HOUR TIME

1 I100=T1/100
T3=T1 - 100.0*I100 + T2
I100=I100 + INT(T3/60)
TIME=I100*100.0 + T3 - 60.0*INT(T3/60)
RETURN

*** SUBTRACT TWO 2400 HOUR TIMES AND RETURN THE RESULT IN MINUTES

2 I100=T1/100
TIME=T1 - I100*40.0
I100=T2/100
TIME=TIME - T2 + I100*40.0
RETURN

*** SUBTRACT A TIME IN MINUTES FROM A 2400 HOUR TIME AND RETURN
A 2400 HOUR TIME

3 IF(T1-T2-INT(T1/100.)*100.0,LT,0.0) GO TO 4
TIME=T1-T2
RETURN

4 T3=T1 - INT(T1/100.)*100.
TIME=INT(T1/100.)*100. - 40. + T3-T2
RETURN
END

EDPP4170
EDPP4180
EDPP4190
EDPP4200
EDPP4210
EDPP4220
EDPP4230
EDPP4240
EDPP4250
EDPP4260
EDPP4270
EDPP4280
EDPP4290
EDPP4300
EDPP4310
EDPP4320
EDPP4330
EDPP4340
EDPP4350
EDPP4360
EDPP4370
EDPP4380
EDPP4390
EDPP4400
EDPP4410
EDPP4420
EDPP4430
EDPP4440
EDPP4450
EDPP4460

SYMBOL GLOSSARY
EMISSIONS DATA PREPARATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
ACT(J,I)	aircraft/day	15x7	Number of flights per day of class I aircraft at airport J
AIRFMS (M,L,I)	lb/min	3x6x7	Aircraft emissions from class I aircraft operating in mode M $L = \begin{cases} 1 \text{ reactive hydrocarbon} \\ 2 \text{ NO} \\ 3 \text{ O}_3 \\ 4 \text{ NO}_2 \\ 5 \text{ CO} \\ 6 \text{ unreacting hydrocarbon} \end{cases}$
AIRFLX(L,J)	ppm-ft/min	6x60	Total flux of species L from airport J
AIRPRT	--	Scalar	Name of the airport
BETA(M,K,L)	--	6x5x12	The "β" correction factor that accounts for the nonuniform distribution of trip starts. M denotes the chemical species
			$M = \begin{cases} 1 \text{ CO} \\ 2 \text{ HC} \\ 3 \text{ NO}_x \end{cases}$
DIST(J,I)	--	15x24	Fraction of daily aircraft flights at airport J assigned to hourly period I (I=1 corresponds to the time period midnight - 1 A.M.)
DT	minute	Scalar	Time interval
DX	feet	Scalar	Grid spacing in x-direction
DY	feet	Scalar	Grid spacing in y-direction
E(M,I,J)	gm/min	3x25x25	Total emissions of species M from automobiles driven in grid square (I,J)
			$M = \begin{cases} 1 \text{ CO} \\ 2 \text{ HC} \\ 3 \text{ NO}_x \end{cases}$

SYMBOL GLOSSARY (Cont'd)
EMISSIONS DATA PREPARATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
EC(I)	grams/mile	3	Automotive cold-start emissions rates $I = \begin{cases} 1 & \text{CO} \\ 2 & \text{HC} \\ 3 & \text{NO}_x \end{cases}$
EH(I)	grams/mile	3	Automotive hot-start emissions rates $I = \begin{cases} 1 & \text{CO} \\ 2 & \text{HC} \\ 3 & \text{NO}_x \end{cases}$
EMIX(J,I)	engines/ aircraft	15x7	Number of engines on class I aircraft operating at airport J
FAIRHC	--	Scalar	Mole fraction of reactive hydrocarbon in total hydrocarbon emissions from aircraft
FAIRNO	--	Scalar	Mole fraction of NO in total NO _x emissions from aircraft
FCARHC	--	Scalar	Mole fraction of reactive hydrocarbon in total hydrocarbon emissions from automobiles
FCARNO	--	Scalar	Mole fraction of NO in total NO _x emissions from automobiles
FFSNO	--	Scalar	Mole fraction of NO in total NO _x emissions from fixed sources
FMIJES(I,J)	miles/min	25x25	Number of miles driven each minute on freeways in grid square (I,J)

SYMBOL GLOSSARY (Cont'd)
EMISSIONS DATA PREPARATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
FWYMLG(I,J)	mile/day	25x25	Total freeway mileage driven each day in grid square (I,J)
FXSOUR(I,J,L)	Kgm/hr	25x25x6	Fixed source emissions assigned to grid square (I,J) $L = \begin{cases} 1 & \text{reactive hydrocarbon} \\ 2 & \text{NO} \\ 3 & \text{O}_3 \\ 4 & \text{NO}_2 \\ 5 & \text{CO} \\ 6 & \text{unreactive hydrocarbon} \end{cases}$
HCEVAP	gm/gm mole	Scalar	Molecular weight of evaporative hydrocarbon
IXORT(J,I)	--	15x4	x-coordinates of the grid squares receiving emissions from airport J
IYORT(J,I)	--	15x4	y-coordinates of the grid squares receiving emissions from airport J
LM	--	Scalar	Controls temporal distribution of fixed sources $LM = \begin{cases} 0 & \text{before 0600 (local time)} \\ 1 & \text{after 0600} \end{cases}$
LN	--	Scalar	Controls the temporal distribution of evaporative hydrocarbon emissions from automobiles $LN = \begin{cases} 0 & \text{before 0700 (local time)} \\ 1 & \text{after 0700} \end{cases}$
N2ME(L)	--	6	Alphanumeric designation of the name of species L

SYMBOL GLOSSARY (Cont'd)
EMISSIONS DATA PREPARATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
NCORT(J)	--	15	Number of grid squares into which emissions from airport J are to be distributed
NOAERT	--	Scalar	Number of airports
PCT(J,I)	--	15x4	Fraction of airport J emissions assigned to grid square (IXORT(J,I), IYORT(J,I))
Q1(L,I,J)	ppm-ft/min	6x25x25	"Old" value of total ground level emissions flux of species L into grid cell (I,J,1)
Q2(L,I,J)	ppm-ft/min	6x25x25	"New" value of total ground level emissions flux of species L into grid cell (I,J,1)
QSLOPE(L,I,J)	ppm-ft/min ²		Time rate of change of the ground level emissions flux of species L into grid cell (I,J,1)
SMILES(I,J)	miles/min	25x25	Number of non-freeway miles driven each minute in grid square (I,J)
SURMLG(I,J)	miles/day	25x25	Total non-freeway mileage driven each day in grid square (I,J)
TDATA	2400 time	Scalar	Beginning of the time interval over which a particular set of data is applicable
TFREE(K)	min ⁻¹	24	Fraction of daily freeway mileage driven each minute during hour K (K=1 corresponds to the time interval midnight - 1 A.M.)

SYMBOL GLOSSARY (Cont'd)
EMISSIONS DATA PREPARATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
TMODE (M, I)	minute	3x7	Amount of time class I aircraft spend in operating mode M
TNEXT	2400 time	Scalar	End of the time interval over which a particular set of data is applicable
TSURF (K)	min ⁻¹	24	Fraction of daily non-freeway mileage driven each minute during hour K (K=1 corresponds to the time interval midnight - 1 A.M.)
VF (I, J) VF1 (I, J)	mph	25x25	Average speed traveled on freeways in the fast direction in grid square (I, J)
VS (I, J) VS1 (I, J)	mph	25x25	Average speed traveled on freeways in the slow direction in grid square (I, J)
WTFS (L)	gm/gm mole	6	Molecular weight of fixed source emissions for species L
X (I, J)	--	25x25	Ratio of the number of cars traveling in the slow direction to the number traveling in the fast direction
XA (I)	--	3	The constant "a" in the speed-emissions correlation formula $I = \begin{Bmatrix} 1 & \text{CO} \\ 2 & \text{HC} \\ 3 & \text{NO}_x \end{Bmatrix}$
XB (I)	--	3	The constant "b" in the speed-emissions correlation formula $I = \begin{Bmatrix} 1 & \text{CO} \\ 2 & \text{HC} \\ 3 & \text{NO}_x \end{Bmatrix}$

SYMBOL GLOSSARY (Cont'd)
EMISSIONS DATA PREPARATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
XAIRHC	--	Scalar	Mass fraction of reactive hydrocarbon in total hydrocarbon emissions from aircraft
XAIRNO	--	Scalar	Mass fraction of NO in total NO _x emissions from aircraft
XCARHC	--	Scalar	Mass fraction of reactive hydrocarbon in total hydrocarbon emissions from automobiles
XCARNO	--	Scalar	Mass fraction of NO in total NO _x emissions from automobiles
XFSNO	--	Scalar	Mass fraction of NO in total NO _x emissions from fixed sources
XMOL(L)	gm/gm mole	6	Molecular weight of species L in automotive emissions
YCS(K)	--	24	Fraction of cars cold-started during hour K (K=1 corresponds to the hourly period midnight - 1 A.M.)

SOURCE STRENGTHS OF CO AT 1100.0 PSI

	1	2	3	4	5	6	7	8	9	10	11	12	13
25	1.3E 00	2.5E-01	7.2E-01	3.2E 00	4.0E CC	4.7E 00	2.2E CC	9.1E-01	3.5E-01	3.6E-01	2.4E-02	0.0	0.0
24	1.3E 00	3.3E 00	4.3E 00	4.7E 00	6.8E CC	5.3E 00	4.8E CC	1.2E CC	1.4E CC	1.2E CC	1.6E CC	1.5E-01	4.2E-02
23	2.9E 00	5.4E 00	5.1E 00	5.1E 00	1.1E C1	4.3E 00	6.7E 00	6.5E CC	2.4E 00	4.2E-01	5.7E-01	3.3E 00	1.1E 00
22	5.1E 00	5.3E 00	5.3E 00	5.3E 00	7.4E CC	8.4E CC	8.1E CC	6.3E CC	7.4E 00	5.9E 00	8.5E-02	2.8E 00	1.2E 00
21	4.5E CC	5.0E 00	5.1E 00	7.6E 00	1.2E C1	1.2E C1	5.6E 00	1.0E C1	6.5E CC	7.4E 00	6.1E 00	4.8E 00	4.5E-01
20	5.3E-01	6.4E-01	3.6E-01	2.5E-01	4.5E CC	1.3E 00	2.6E CC	4.6E CC	5.6E 00	5.3E-01	9.0E 00	5.1E 00	4.2E 00
19	1.9E-01	5.3E-01	0.0	4.2E-02	3.9E CC	1.5E CC	6.8E-01	5.5E 00	1.2E C1	9.7E 00	8.1E 00	6.5E 00	4.2E 00
18	0.0	3.8E-01	0.0	1.5E-01	4.3E CC	7.3E 00	8.6E CC	1.2E C1	1.1E C1	1.4E C1	1.4E C1	1.0E C1	4.9E 00
17	1.0E 00	1.4E 00	2.1E 00	2.5E 00	4.9E CC	1.5E C1	8.6E CC	1.3E C1	1.4E C1	1.4E C1	2.1E C1	1.6E C1	1.1E C1
16	0.0	0.0	0.0	2.7E 00	1.1E C1	9.2E 00	1.2E C1	6.6E CC	8.8E 00	8.8E CC	1.4E C1	1.3E C1	1.3E C1
15	0.0	0.0	0.0	0.0	1.9E CC	4.5E 00	6.2E CC	6.5E CC	6.6E CC	1.0E C1	1.4E C1	7.7E 00	6.2E 00
14	0.0	0.0	0.0	0.0	0.0	2.3E 00	7.2E 00	1.2E C1	8.3E 00	7.0E 00	1.2E C1	5.8E 00	6.8E 00
13	0.0	0.0	0.0	0.0	0.0	4.7E-01	1.0E C1	1.1E C1	9.2E 00	6.1E 00	9.4E CC	5.4E 00	6.2E 00
12	0.0	0.0	0.0	0.0	0.0	0.0	4.0E CC	8.4E CC	7.3E 00	7.6E 00	6.1E CC	4.0E 00	7.7E 00
11	0.0	0.0	0.0	0.0	0.0	0.0	2.6E 00	4.4E 00	1.2E C1	9.8E CC	6.4E CC	2.6E 00	7.9E 00
10	0.0	0.0	0.0	0.0	0.0	0.0	1.9E-01	7.6E CC	6.5E CC	4.5E 00	8.3E CC	1.7E 00	6.5E 00
9	0.0	0.0	0.0	0.0	0.0	0.0	2.1E-02	5.1E 00	7.2E 00	5.3E 00	4.9E CC	5.1E 00	1.1E C1
8	0.0	0.0	0.0	0.0	0.0	0.0	4.8E-01	2.6E 00	4.2E 00	5.7E 00	6.7E CC	3.7E 00	9.7E 00
7	0.0	0.0	0.0	0.0	0.0	0.0	6.4E-01	1.0E CC	5.5E-01	3.0E CC	3.2E 00	1.8E 00	3.3E 00
6	0.0	0.0	0.0	0.0	0.0	0.0	8.5E-02	1.1E-01	5.3E-01	3.7E CC	1.9E 00	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1E-01	1.1E-01	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	14	15	16	17	18	19	20	21	22	23	24	25
25	8.5E-02	4.2E-02	2.1E-02	4.2E-02	4.2E-02	2.1E-02	0.0	0.0	0.0	4.2E-02	0.0	0.0
24	0.0	0.0	4.2E-02	0.0	0.0	0.0	0.0	0.0	0.0	4.2E-02	0.0	0.0
23	8.5E-02	0.0	0.0	2.1E-02	0.0	0.0	0.0	0.0	0.0	4.2E-02	0.0	0.0
22	2.3E-00	2.4E-00	4.5E-01	2.1E-02	4.2E-02	0.0	0.0	0.0	2.1E-02	4.2E-02	0.0	0.0
21	3.7E-00	5.1E-00	4.5E-00	3.3E-00	1.9E-00	1.2E-00	2.1E-02	1.3E-01	1.3E-01	4.2E-02	0.0	0.0
20	4.3E-00	7.0E-00	6.5E-00	5.1E-00	5.0E-00	4.6E-00	2.2E-00	3.3E-00	3.6E-00	3.3E-00	1.6E-00	6.8E-01
19	5.0E-00	5.0E-00	4.8E-00	5.0E-00	3.9E-00	3.4E-00	2.8E-00	3.3E-00	4.5E-00	3.0E-00	1.4E-00	2.2E-00
18	7.2E-00	8.8E-00	7.9E-00	8.1E-00	8.7E-00	5.7E-00	6.7E-00	1.5E-00	7.0E-00	3.1E-00	1.8E-00	3.3E-00
17	8.9E-00	6.0E-00	2.3E-00	4.4E-00	6.3E-00	4.1E-00	3.8E-00	3.0E-00	3.8E-01	1.0E-00	1.1E-00	1.7E-00
16	1.1E-01	5.6E-00	4.1E-00	4.6E-00	3.3E-00	2.2E-00	5.5E-00	2.6E-00	9.4E-01	1.1E-00	8.4E-01	2.4E-01
15	8.4E-00	9.4E-00	4.2E-00	6.3E-00	1.5E-00	4.5E-01	1.5E-00	1.4E-00	2.3E-00	8.9E-01	2.8E-01	0.0
14	9.0E-00	6.8E-00	9.4E-00	4.3E-00	6.3E-00	2.5E-00	8.9E-01	4.7E-01	2.1E-02	7.6E-01	2.1E-02	1.1E-01
13	8.2E-00	8.2E-00	1.0E-01	5.1E-00	5.0E-00	3.8E-00	9.1E-00	3.3E-00	2.2E-00	4.4E-01	1.9E-01	1.5E-01
12	6.7E-00	6.3E-00	8.0E-00	7.5E-00	3.8E-00	2.4E-00	1.3E-00	2.7E-00	2.4E-00	2.0E-00	1.2E-00	8.5E-02
11	6.6E-00	6.9E-00	5.5E-00	3.0E-00	4.4E-00	2.0E-00	3.8E-00	6.2E-00	4.3E-00	1.7E-00	1.0E-00	7.8E-01
10	6.1E-00	9.1E-00	6.5E-00	2.9E-00	4.5E-00	7.2E-00	8.1E-00	9.1E-00	6.4E-00	3.4E-00	2.5E-00	9.0E-01
9	1.3E-01	1.2E-01	5.3E-00	3.3E-00	3.7E-00	5.5E-00	4.8E-00	7.8E-00	4.2E-00	2.6E-00	3.6E-00	2.3E-01
8	8.2E-00	6.7E-00	8.2E-00	9.3E-00	4.8E-00	5.7E-00	4.7E-00	5.4E-00	6.8E-00	5.0E-00	4.9E-00	5.9E-01
7	2.7E-00	3.3E-00	3.7E-00	1.3E-00	4.3E-00	5.5E-00	5.9E-00	6.0E-00	5.3E-00	8.70E-00	5.1E-00	6.8E-01
6	0.0	0.0	7.0E-01	1.0E-00	2.4E-00	5.5E-00	3.2E-00	3.5E-00	4.3E-00	4.6E-00	3.6E-00	1.1E-00
5	0.0	0.0	0.0	7.6E-01	5.1E-01	2.8E-00	3.0E-00	3.6E-00	3.1E-00	3.0E-00	2.3E-01	1.4E-00
4	0.0	0.0	0.0	0.0	7.6E-01	2.7E-00	2.3E-00	5.3E-00	5.4E-00	5.2E-00	1.2E-00	8.5E-01
3	0.0	0.0	0.0	0.0	0.0	7.2E-01	2.2E-00	6.6E-00	2.1E-00	2.4E-00	2.1E-01	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	1.5E-01	4.8E-00	4.2E-00	1.1E-00	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1E-01	2.3E-00	3.8E-01	0.0

STURGE STRENGTHS CF NC AT 1100.0 PSI

	1	2	3	4	5	6	7	8	9	10	11	12	13
25	5.9E-02	8.5E-03	2.4E-02	1.1E-01	1.8E-01	2.1E-01	1.2E-01	5.5E-02	2.3E-02	1.9E-02	7.1E-04	0.0	0.0
24	4.2E-02	1.1E-01	1.5E-01	1.6E-01	2.5E-01	2.2E-01	2.2E-01	9.3E-02	7.7E-02	8.4E-02	7.1E-02	1.0E-02	1.4E-01
23	1.2E-01	2.1E-01	1.9E-01	2.2E-01	3.8E-01	2.5E-01	3.1E-01	3.0E-01	1.4E-01	1.7E-02	2.2E-02	1.3E-01	5.6E-02
22	1.9E-01	2.0E-01	2.1E-01	2.3E-01	3.6E-01	3.3E-01	3.5E-01	2.5E-01	2.6E-01	2.6E-01	1.4E-02	1.1E-01	6.3E-02
21	2.2E-01	2.6E-01	2.9E-01	4.0E-01	6.7E-01	5.3E-01	4.6E-01	5.0E-01	3.0E-01	3.8E-01	2.8E-01	2.0E-01	1.8E-02
20	1.8E-02	2.1E-02	1.7E-02	8.5E-03	2.5E-01	5.6E-02	9.7E-02	2.1E-01	2.6E-01	4.5E-02	4.4E-01	2.0E-01	1.7E-01
19	6.4E-03	1.8E-02	0.0	4.7E-03	2.3E-01	6.9E-02	4.8E-02	2.3E-01	5.1E-01	4.3E-01	4.0E-01	3.6E-01	2.5E-01
18	0.0	1.3E-02	0.0	7.7E-03	2.2E-01	3.1E-01	3.1E-01	4.2E-01	3.9E-01	5.6E-01	6.2E-01	5.5E-01	3.3E-01
17	5.9E-02	6.7E-02	9.7E-02	1.1E-01	2.2E-01	6.5E-01	3.8E-01	5.7E-01	6.4E-01	6.6E-01	9.7E-01	7.3E-01	6.0E-01
16	0.0	0.0	0.0	9.9E-02	4.2E-01	4.0E-01	5.9E-01	2.7E-01	3.5E-01	3.4E-01	7.2E-01	5.9E-01	6.9E-01
15	0.0	0.0	0.0	0.0	9.0E-02	2.7E-01	4.1E-01	3.3E-01	2.8E-01	3.9E-01	6.2E-01	3.6E-01	3.1E-01
14	0.0	0.0	0.0	0.0	0.0	1.1E-01	2.9E-01	5.4E-01	2.4E-01	2.4E-01	5.4E-01	2.8E-01	3.1E-01
13	0.0	0.0	0.0	0.0	0.0	3.2E-02	3.7E-01	5.2E-01	3.5E-01	2.6E-01	4.6E-01	2.5E-01	2.7E-01
12	0.0	0.0	0.0	0.0	0.0	0.0	1.7E-00	4.6E-01	3.2E-01	3.1E-01	3.3E-01	2.5E-01	3.6E-01
11	0.0	0.0	0.0	0.0	0.0	0.0	1.0E-01	2.1E-01	5.9E-01	5.1E-01	3.7E-01	1.5E-01	4.0E-01
10	0.0	0.0	0.0	0.0	0.0	0.0	2.0E-02	3.1E-01	1.3E-00	2.6E-01	6.2E-01	4.5E-01	3.5E-01
9	0.0	0.0	0.0	0.0	0.0	0.0	7.1E-04	2.2E-01	2.8E-01	2.6E-01	3.7E-01	1.9E-00	6.0E-01
8	0.0	0.0	0.0	0.0	0.0	0.0	6.0E-02	1.4E-01	1.9E-01	2.5E-01	3.3E-01	1.5E-00	4.5E-01
7	0.0	0.0	0.0	0.0	0.0	0.0	6.0E-02	8.4E-02	7.8E-02	1.6E-01	1.8E-01	1.7E-01	2.1E-01
6	0.0	0.0	0.0	0.0	0.0	0.0	1.4E-02	2.0E-02	5.5E-02	1.8E-01	6.8E-02	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5E-03	3.5E-03	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	14	15	16	17	18	19	20	21	22	23	24	25
25	2.8E-03	1.4E-03	7.1E-04	1.4E-03	1.4E-03	7.1E-04	0.0	0.0	0.0	1.4E-03	0.0	0.0
24	0.0	0.0	1.4E-03	0.0	0.0	0.0	0.0	0.0	0.0	1.4E-03	0.0	0.0
23	5.6E-03	0.0	0.0	7.1E-04	0.0	0.0	0.0	0.0	0.0	1.4E-03	0.0	0.0
22	1.1E-01	1.0E-01	2.3E-02	7.1E-04	1.4E-03	0.0	0.0	0.0	7.1E-04	1.4E-03	0.0	0.0
21	1.5E-01	2.0E-01	1.4E-01	1.5E-01	1.2E-01	8.5E-02	3.9E-02	4.0E-02	2.9E-02	2.6E-02	2.5E-02	2.2E-02
20	2.2E-01	2.9E-01	2.4E-01	2.1E-01	2.3E-01	2.2E-01	1.3E-01	1.4E-01	1.5E-01	1.4E-01	7.3E-02	2.3E-02
19	2.2E-01	2.2E-01	2.1E-01	2.2E-01	1.8E-01	1.7E-01	1.5E-01	1.6E-01	2.1E-01	1.5E-01	7.2E-02	0.1E-02
18	3.4E-01	4.0E-01	3.8E-01	3.9E-01	3.5E-01	3.2E-01	3.3E-01	3.5E-01	3.1E-01	3.7E-02	3.8E-02	6.8E-02
17	4.9E-01	3.1E-01	1.5E-01	2.7E-01	3.5E-01	2.4E-01	1.8E-01	1.4E-01	1.5E-02	8.7E-02	6.2E-02	3.4E-02
16	6.2E-01	2.4E-01	2.0E-01	2.3E-01	1.8E-01	1.3E-01	2.4E-01	1.4E-01	8.2E-02	8.7E-02	6.2E-02	3.4E-02
15	4.4E-01	4.6E-01	2.0E-01	3.4E-01	6.3E-02	2.3E-02	9.0E-02	6.5E-02	9.1E-02	3.8E-02	1.0E-02	0.0
14	4.7E-01	3.2E-01	4.9E-01	2.1E-01	2.6E-01	1.0E-01	2.5E-02	1.6E-02	7.1E-04	2.6E-02	7.1E-04	3.5E-03
13	4.2E-01	3.4E-01	5.5E-01	4.7E-01	2.4E-01	1.9E-01	2.0E-01	1.4E-01	8.7E-02	1.5E-02	6.4E-03	4.9E-03
12	4.2E-01	4.4E-01	4.1E-01	7.8E-01	2.3E-01	1.4E-01	7.4E-02	1.7E-01	1.1E-01	8.9E-02	4.0E-02	2.8E-02
11	4.0E-01	3.1E-01	3.5E-01	1.4E-01	2.7E-01	2.7E-01	1.6E-01	2.4E-01	1.8E-01	8.8E-02	3.9E-02	3.0E-02
10	2.7E-01	3.7E-01	3.7E-01	1.5E-01	2.0E-01	2.9E-01	3.9E-01	4.0E-01	2.8E-01	1.7E-01	1.5E-01	5.3E-02
9	4.1E-01	4.5E-01	2.9E-01	1.4E-01	1.5E-01	2.1E-01	1.9E-01	3.2E-01	1.5E-01	1.2E-01	1.7E-01	7.8E-03
8	4.2E-01	2.8E-01	4.8E-01	3.0E-01	2.4E-01	2.6E-01	1.9E-01	2.3E-01	3.4E-01	2.4E-01	2.4E-01	2.0E-02
7	1.7E-01	1.7E-01	1.6E-01	7.3E-02	2.2E-01	2.4E-01	2.8E-01	2.7E-01	2.1E-01	3.7E-01	2.3E-01	2.3E-02
6	0.0	0.0	3.7E-02	6.4E-02	1.1E-01	7.6E-01	1.6E-01	1.5E-01	1.7E-01	2.0E-01	1.7E-01	5.8E-02
5	0.0	0.0	0.0	3.9E-02	4.7E-02	1.2E-01	1.5E-01	2.0E-01	1.5E-01	1.4E-01	7.8E-03	7.1E-02
4	0.0	0.0	0.0	0.0	3.9E-02	1.2E-01	1.1E-01	2.1E-01	2.4E-01	1.3E-01	5.4E-02	4.4E-02
3	0.0	0.0	0.0	0.0	0.0	3.8E-02	1.0E-01	2.7E-01	1.0E-01	8.1E-02	7.1E-03	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	1.3E-02	1.9E-01	1.7E-01	3.7E-02	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8E-03	1.2E-02	8.4E-02	1.3E-02	0.0

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*****MOPP0010
C*                                     *MOPP0020
C* THE METEOROLOGICAL DATA PREPARATION PROGRAM *MOPP0030
C*                                     *MOPP0040
C*                                     *MOPP0050
C* WRITTEN BY: STEVEN D. REYNOLDS *MOPP0060
C*                                     *MOPP0070
C* FOR *MOPP0080
C*                                     *MOPP0090
C* SYSTEMS APPLICATIONS, INC. *MOPP0100
C* 9418 WILSHIRE BLVD. *MOPP0110
C* BEVERLY HILLS, CALIFORNIA 90212 *MOPP0120
C*                                     *MOPP0130
C*                                     *MOPP0140
C* JCL INFORMATION *MOPP0150
C*                                     *MOPP0160
C* FT04F001 METEOROLOGICAL DATA FILE *MOPP0170
C* FT05F001 CARD READER *MOPP0180
C* FT06F001 PRINTER *MOPP0190
C*                                     *MOPP0200
C* THE METEOROLOGICAL DATA FILE IS DEFINED AS FOLLOWS (USING A 9 *MOPP0210
C* TRACK, 1600 BPI TAPE) : *MOPP0220
C*                                     *MOPP0230
C* FT04F001 DD UNIT=(TAPE16,,DEFER),LABEL=(1,BLP),DISP=(OLD,KEEP), *MOPP0240
C* VOL=SF=MF001,DCB=(RECFM=VS,LRECL=2504,BLKSIZE=2508) *MOPP0250
C*                                     *MOPP0260
C* *****MOPP0270
C* DIMENSION W(25,25),A(25,25),IW(25,25),IA(25,25),DH(25,25),H(25,25), *MOPP0280
C* 12),IH(25,25),DATE(2) *MOPP0290
C* LOGICAL KFLAG *MOPP0300
C* DATA KFLAG/,FALSE,/ *MOPP0310
C*                                     *MOPP0320
C* *** INPUT CARD NO. 1 *MOPP0330
C*                                     *MOPP0340
C* READ(5,71) NX,NY,TSTART,TSTOP,DATE *MOPP0350
71 FORMAT(2I5,2F10.0,2A4) *MOPP0360
C* DT=30. *MOPP0370
C* TDATA=TSTART *MOPP0380
C* TNEXT=TIME(TDATA,DT,1) *MOPP0390
C*                                     *MOPP0400
C* *** INPUT CARD NO. 2 AND WRITE THE INITIAL MIXING DEPTHS ON THE *MOPP0410
C* FILE *MOPP0420
C*                                     *MOPP0430
C* READ(5,50) ((H(I,J,1),I=1,NX),J=1,NY) *MOPP0440
C* WRITE(4) ((H(I,J,1),I=1,NX),J=1,NY) *MOPP0450
C*                                     *MOPP0460
C* *** INPUT CARD NO. 3 AND 4 *MOPP0470
C*                                     *MOPP0480
C* READ(5,51) W *MOPP0490
C* READ(5,50) A *MOPP0500
C*                                     *MOPP0510
C* *** CONVERT WIND SPEEDS FROM MILES/HOUR TO FEET/MINUTE AND WIND *MOPP0520
C* DIRECTIONS FROM DEGREES TO RADIANS *MOPP0530
C*                                     *MOPP0540
C* DO 2 I=1,NX *MOPP0550
C* DO 2 J=1,NY *MOPP0560
C* A(I,J)=A(I,J)/57.2958 *MOPP0570
2 W(I,J)=W(I,J)*88, *MOPP0580
C* GO TO 7 *MOPP0590
C* DO 5 I=1,NX *MOPP0600

```

5 DO 5 J=1,NY
 M(I,J,1)=M(I,J,2)
 TDATA=TIME(TDATA,DT,1)
 TNEXT=TIME(TNEXT,DT,1)
 IF(TDATA,GE,TSTOP) GO TO 40

C
 C *** INPUT CARD NO. 5
 C

7 READ(5,50) ((M(I,J,2),I=1,NX),J=1,NY)

C
 C *** COMPUTE THE TIME RATE OF CHANGE OF THE MIXING DEPTHS
 C

3 DO 3 I=1,NX
 DO 3 J=1,NY
 DM(I,J)=(M(I,J,2)-M(I,J,1))/60.

C
 C *** WRITE THE TIME INTERVAL,WIND SPEEDS,WIND DIRECTIONS, AND
 C TIME RATE OF CHANGE OF THE MIXING DEPTHS ON THE FILE

C
 C WRITE(4) TDATA,TNEXT
 C WRITE(4) W
 C WRITE(4) A
 C WRITE(4) DM

C
 C *** COMPUTE THE NEXT TIME INTERVAL
 C

TDATA=TIME(TDATA,DT,1)
 TNEXT=TIME(TNEXT,DT,1)
 IF(TDATA,GE,TSTOP) GO TO 40

C
 C *** INPUT CARD NO. 6 AND 7
 C

51 READ(5,51) W
 FORMAT(13F5,1/12F5,1)
 50 READ(5,50) A
 FORMAT(13F5,0/12F5,0)

C
 C *** CONVERT WIND SPEEDS FROM MILES/HOUR TO FEET/MINUTE AND WIND
 C DIRECTIONS FROM DEGREES TO RADIANS
 C

4 DO 4 I=1,NX
 DO 4 J=1,NY
 A(I,J)=A(I,J)/57.2958
 W(I,J)=W(I,J)*88,

C
 C *** WRITE THE TIME INTERVAL,WIND SPEEDS,WIND DIRECTIONS, AND
 C TIME RATE OF CHANGE OF THE MIXING DEPTHS ON THE FILE
 C

C
 C WRITE(4) TDATA,TNEXT
 C WRITE(4) W
 C WRITE(4) A
 C WRITE(4) DM

C
 C *** CYCLE BACK FOR NEXT SET OF DATA
 C

GO TO 1

C
 C *** IN THIS SECTION OF CODE, HOURLY MAPS OF WIND SPEED, WIND
 C DIRECTION, AND MIXING DEPTH ARE PRINTED

MDPP0610
 MDPP0620
 MDPP0630
 MDPP0640
 MDPP0650
 MDPP0660
 MDPP0670
 MDPP0680
 MDPP0690
 MDPP0700
 MDPP0710
 MDPP0720
 MDPP0730
 MDPP0740
 MDPP0750
 MDPP0760
 MDPP0770
 MDPP0780
 MDPP0790
 MDPP0800
 MDPP0810
 MDPP0820
 MDPP0830
 MDPP0840
 MDPP0850
 MDPP0860
 MDPP0870
 MDPP0880
 MDPP0890
 MDPP0900
 MDPP0910
 MDPP0920
 MDPP0930
 MDPP0940
 MDPP0950
 MDPP0960
 MDPP0970
 MDPP0980
 MDPP0990
 MDPP1000
 MDPP1010
 MDPP1020
 MDPP1030
 MDPP1040
 MDPP1050
 MDPP1060
 MDPP1070
 MDPP1080
 MDPP1090
 MDPP1100
 MDPP1110
 MDPP1120
 MDPP1130
 MDPP1140
 MDPP1150
 MDPP1160
 MDPP1170
 MDPP1180
 MDPP1190
 MDPP1200

40	REWIND 4	MDPP1210
C	*** READ INITIAL MIXING DEPTHS	MDPP1220
C		MDPP1230
	READ(4) ((H(I,J,1),I=1,NX),J=1,NY)	MDPP1240
C		MDPP1250
C	*** READ TIME INTERVAL, WIND SPEEDS, WIND DIRECTIONS, AND TIME	MDPP1260
C	RATE OF CHANGE OF THE MIXING DEPTHS	MDPP1270
C		MDPP1280
27	READ(4,END=56) TDATA,TNEXT	MDPP1290
	READ(4) W	MDPP1300
	READ(4) A	MDPP1310
	READ(4) DH	MDPP1320
	GO TO 57	MDPP1330
56	KFLAG=,TRUE,	MDPP1340
	TDATA=TNEXT	MDPP1350
		MDPP1360
C	*** CONVERT WIND SPEEDS FROM FEET/MINUTE TO MILES/HOUR AND	MDPP1370
C	WIND DIRECTIONS FROM RADIANS TO DEGREES, AND THEN ROUND-OFF	MDPP1380
C	THE RESULT	MDPP1390
C		MDPP1400
57	DO 21 I=1,NX	MDPP1410
	DO 21 J=1,NY	MDPP1420
	IA(I,J)=A(I,J)*57.2958 +0.5	MDPP1430
	IW(I,J)=W(I,J)/8.8 +0.5	MDPP1440
21	IH(I,J)=H(I,J,1) +0.5	MDPP1450
C		MDPP1460
C	*** PRINT WIND SPEED MAP	MDPP1470
C		MDPP1480
	WRITE(6,30) DATE,TDATA,(I,I=1,NX)	MDPP1490
30	FORMAT(1H1,48X,'WIND SPEED ON ',2A4,' AT ',F6.1,' PST'///5X,25I5//	MDPP1500
1)		MDPP1510
	DO 22 JJ=1,NY	MDPP1520
	J=NY+1-JJ	MDPP1530
22	WRITE(6,52) J,(IW(I,J),I=1,NX)	MDPP1540
52	FORMAT(/1X,12,2X,25I5)	MDPP1550
C		MDPP1560
C	*** PRINT WIND DIRECTION MAP	MDPP1570
C		MDPP1580
	WRITE(6,31) DATE,TDATA,(I,I=1,NX)	MDPP1590
31	FORMAT(1H1,46X,'WIND DIRECTION ON ',2A4,' AT ',F6.1,' PST'///4X,	MDPP1600
125I5//)		MDPP1610
	DO 23 JJ=1,NY	MDPP1620
	J=NY+1-JJ	MDPP1630
23	WRITE(6,52) J,(IA(I,J),I=1,NX)	MDPP1640
C		MDPP1650
C	*** PRINT MIXING DEPTH MAP	MDPP1660
C		MDPP1670
	WRITE(6,32) DATE,TDATA,(I,I=1,NX)	MDPP1680
32	FORMAT(1H1,46X,'MIXING DEPTHS ON ',2A4,' AT ',F6.1,' PST'///4X,25I	MDPP1690
15//)		MDPP1700
	DO 24 JJ=1,NY	MDPP1710
	J=NY+1-JJ	MDPP1720
24	WRITE(6,52) J,(IH(I,J),I=1,NX)	MDPP1730
	IF(KFLAG) STOP	MDPP1740
C		MDPP1750
C	*** CALCULATE MIXING DEPTHS APPLICABLE AT TNEXT	MDPP1760
C		MDPP1770
	DT=TIME(TNEXT,TDATA,2)	MDPP1780
	DO 25 I=1,NX	MDPP1790
		MDPP1800

DO 25 J=1,NY
 M(I,J,1)=M(I,J,1) + DT*DH(I,J)

*** READ THE NEXT TIME INTERVAL, WIND SPEEDS, WIND DIRECTIONS,
 AND TIME RATE OF CHANGE OF THE MIXING DEPTHS

READ(4,END=60) TDATA,TNEXT
 READ(4) W
 READ(4) A
 READ(4) DH

*** CALCULATE MIXING DEPTHS APPLICABLE AT TNEXT

DT=TIME(TNEXT,TDATA,2)

DO 26 I=1,NX

DO 26 J=1,NY

M(I,J,1)=M(I,J,1) + DT*DH(I,J)

*** CYCLE BACK FOR THE NEXT BLOCK OF METEOROLOGICAL DATA

GO TO 27

STOP

END

MDPP1810
 MDPP1820
 MDPP1830
 MDPP1840
 MDPP1850
 MDPP1860
 MDPP1870
 MDPP1880
 MDPP1890
 MDPP1900
 MDPP1910
 MDPP1920
 MDPP1930
 MDPP1940
 MDPP1950
 MDPP1960
 MDPP1970
 MDPP1980
 MDPP1990
 MDPP2000
 MDPP2010
 MDPP2020
 MDPP2030

REAL FUNCTION TIME(T1,T2,M)
GO TO (1,2,3),M

*** ADD A TIME IN MINUTES TO A 2400 HOUR TIME AND RETURN A 2400
HOUR TIME

1 I100=T1/100
T3=T1 - 100.0*I100 + T2
I100=I100 + INT(T3/60)
TIME=I100*100.0 + T3 - 60.0*INT(T3/60)
RETURN

*** SUBTRACT TWO 2400 HOUR TIMES AND RETURN THE RESULT IN MINUTES

2 I100=T1/100
TIME=T1 - I100*40.0
I100=T2/100
TIME=TIME - T2 + I100*40.0
RETURN

*** SUBTRACT A TIME IN MINUTES FROM A 2400 HOUR TIME AND RETURN
A 2400 HOUR TIME

3 IF(T1-T2-INT(T1/100.)*100.0.LT.0.0) GO TO 4
TIME=T1-T2
RETURN
4 T3=T1 - INT(T1/100.)*100.
TIME=INT(T1/100.)*100. - 40. + T3-T2
RETURN
END

MDPP2040
MDPP2050
MDPP2060
MDPP2070
MDPP2080
MDPP2090
MDPP2100
MDPP2110
MDPP2120
MDPP2130
MDPP2140
MDPP2150
MDPP2160
MDPP2170
MDPP2180
MDPP2190
MDPP2200
MDPP2210
MDPP2220
MDPP2230
MDPP2240
MDPP2250
MDPP2260
MDPP2270
MDPP2280
MDPP2290
MDPP2300
MDPP2310
MDPP2320
MDPP2330

SYMBOL GLOSSARY
METEOROLOGICAL DATA PREPARATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
A(I,J)	degrees	25x25	Direction in which the wind is flowing at grid square (I,J), measured clockwise from north. The directions are converted from degrees to radians before they are placed in the Meteorological Data File.
DATE(I)	--	2	Alphanumeric designation of the date for which the data is applicable.
DH(I,J)	feet/min	25x25	Time rate of change of the mixing depth at grid square (I,J).
DT	minute	Scalar	Time interval
H(I,J,M)	feet	25x25x2	"Old" (M=1) and "new" (M=2) values of the mixing depth at grid square (I,J)
IA(I,J)	degrees	25x25	Wind direction at grid square (I,J)
IH(I,J)	feet	25x25	Mixing depth at grid square (I,J)
IW(I,J)	mph	25x25	Wind speed at grid square (I,J)
NX	--	Scalar	Number of grid points in the x-direction
NY	--	Scalar	Number of grid points in the y-direction
TDATA	2400 time	Scalar	Beginning of a time interval over which a particular set of data are applicable
TNEXT	2400 time	Scalar	End of a time interval over which a particular set of data are applicable
TSTART	2400 time	Scalar	Time at which the first set of meteorological data are applicable

SYMBOL GLOSSARY (Cont'd)
METEOROLOGICAL DATA PREPARATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
TSTOP	2400 time	Scalar	Time at which the last set of meteorological data is applicable
W(I,J)	mph	25x25	Wind speed at grid square (I,J); converted from mph to feet/minute

WIND SPEED ON 9/29/69 AT 1100.0 PST

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
25	10	10	10	10	10	20	20	25	20	30	35	35	40	40	40	45	45	50	50	50	50	50	50	50	50
24	12	12	12	12	12	22	22	25	30	35	35	35	40	40	40	45	50	50	50	50	50	50	50	50	50
23	10	10	10	10	10	20	20	25	30	35	35	40	40	40	40	40	40	45	50	50	50	50	50	50	50
22	10	10	20	20	20	20	20	25	30	35	35	40	40	40	40	40	40	45	50	50	50	50	50	50	50
21	22	22	30	32	32	32	32	32	32	35	42	45	40	40	40	40	40	40	40	40	40	40	40	40	40
20	30	30	30	30	30	30	30	30	30	35	40	45	45	45	45	45	45	45	45	45	45	45	45	45	45
19	30	30	30	30	30	30	30	35	35	45	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
18	32	32	32	32	32	35	35	42	42	52	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
17	30	30	30	40	40	40	40	50	50	60	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
16	40	40	40	40	50	50	50	60	60	65	65	70	70	70	70	70	70	70	70	70	70	70	70	70	70
15	40	40	52	52	62	62	62	62	65	65	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
14	50	50	60	60	60	60	60	60	65	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
13	60	60	60	60	60	60	60	60	65	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
12	60	60	55	55	55	55	55	55	60	70	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
11	55	55	55	55	55	55	55	55	62	72	75	80	75	70	62	52	52	52	52	52	52	52	52	52	52
10	55	55	55	55	55	50	50	50	60	65	70	70	65	60	55	50	45	40	40	35	30	30	30	30	30
9	50	50	50	50	50	50	50	50	55	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
8	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
7	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52
6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
5	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
4	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
3	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
2	45	45	45	45	45	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
1	45	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40

WIND DIRECTION ON 9/29/69 AT 1100.0 PST

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
25	67	67	67	66	66	65	63	61	59	57	55	53	45	37	35	35	35	36	36	37	38	42	45	47	47
24	72	72	71	73	68	66	65	62	60	58	56	50	43	37	37	40	39	39	39	35	37	42	45	47	47
23	76	75	74	73	70	67	67	63	62	59	53	47	41	42	45	45	42	39	39	35	37	42	45	53	53
22	80	78	77	75	72	68	69	65	60	56	50	46	42	41	45	45	42	42	41	40	45	50	51	54	55
21	83	81	79	77	74	73	67	63	58	53	47	45	42	40	40	40	40	40	40	42	47	50	53	55	55
20	84	80	76	74	71	67	64	60	55	50	47	45	43	45	40	40	40	44	44	45	45	52	57	57	57
19	81	78	73	71	68	64	61	57	52	51	49	47	47	43	45	49	46	50	52	54	54	59	62	62	60
18	77	74	70	68	65	61	58	54	53	52	52	52	52	51	51	53	55	57	57	58	62	64	65	65	65
17	74	71	68	66	62	58	56	54	55	55	55	55	55	55	57	60	60	60	60	65	67	67	67	67	70
16	69	68	66	64	60	57	54	56	56	57	57	58	57	55	55	58	59	59	60	62	66	67	68	74	75
15	66	65	64	62	60	58	58	58	59	62	62	62	62	62	63	65	65	66	66	66	66	67	68	69	83
14	63	63	63	62	60	58	58	59	60	63	62	62	62	62	65	65	66	66	68	70	75	80	85	85	85
13	63	63	62	63	63	63	61	62	62	62	62	65	65	65	65	69	69	67	75	77	83	85	87	87	87
12	63	60	59	59	59	60	62	62	64	64	64	66	66	66	68	68	70	75	80	85	87	89	89	89	89
11	59	59	59	59	60	62	63	63	63	63	64	65	70	72	76	76	76	78	80	81	82	82	86	87	87
10	59	59	63	63	63	63	63	63	62	65	66	66	68	69	71	74	77	83	84	86	86	86	86	86	86
9	59	60	60	60	58	58	59	62	63	65	66	67	70	75	75	76	77	80	82	85	86	86	86	86	86
8	59	57	57	57	57	58	60	62	63	64	66	68	70	75	76	76	79	82	82	82	82	86	88	90	90
7	58	55	55	55	58	60	62	62	64	65	73	72	75	76	76	76	77	82	82	82	85	87	88	88	88
6	55	55	55	57	58	60	61	62	63	66	70	72	72	76	77	81	83	84	84	86	87	91	94	94	94
5	55	56	59	60	62	63	65	71	71	72	72	72	76	77	81	83	84	85	87	93	92	93	94	95	95
4	57	60	60	62	70	70	72	72	74	75	77	80	80	81	81	83	84	85	87	93	92	93	94	95	95
3	65	70	71	71	71	72	75	77	79	79	79	79	80	81	81	83	83	85	86	89	91	92	94	95	95
2	72	74	78	79	79	79	79	79	79	83	78	77	80	81	82	82	83	85	86	89	92	94	96	97	97
1	80	80	80	80	80	80	80	80	80	80	80	81	82	82	84	85	85	87	90	91	92	93	95	95	95

MIXING DEPTHS ON 9/29/69 AT 1100.0 PST

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
25	1250	1250	1200	1200	1200	1200	1200	1200	1200	1100	1000	900	800	800	800	800	800	800	800	800	800	800	800	800	800
24	1000	1222	1222	1222	1222	1222	1222	1222	1222	1222	1222	922	822	822	822	822	822	822	822	822	800	800	800	800	800
23	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	900	800	800	800	800	800	800	800	800	800	800	800	800	800
22	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	900	850	800	800	800	800	800	800	800	800	800	800	800	800
21	950	950	950	950	950	950	950	950	950	950	950	922	920	920	920	920	920	920	920	920	920	920	920	920	920
20	900	900	900	900	900	900	900	900	900	900	900	950	950	900	1000	1000	1000	1000	1000	1000	1000	1000	950	950	950
19	822	822	822	822	822	822	822	822	822	822	822	900	925	950	975	1000	1000	1000	1000	1000	1000	1000	950	950	950
18	700	700	700	700	725	750	775	800	825	850	875	900	925	950	975	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
17	600	600	600	600	630	660	700	730	760	790	820	850	880	910	945	980	1000	1000	1000	1000	1000	1000	1000	1000	1000
16	550	550	550	550	570	600	630	660	690	720	750	780	810	840	870	900	930	960	990	1000	1000	1000	1000	1000	1000
15	550	550	550	550	570	600	630	660	690	720	750	780	810	840	870	900	930	960	990	1000	1000	1000	1000	1000	1000
14	550	550	550	550	570	600	630	660	690	720	750	780	810	840	870	900	930	960	990	1000	1000	1000	1000	1000	1000
13	550	550	550	550	570	600	630	660	690	720	750	780	810	840	870	900	930	960	990	1000	1000	1000	1000	1000	1000
12	550	550	550	550	570	600	630	660	690	720	750	780	810	840	870	900	930	960	990	1000	1000	1000	1000	1000	1000
11	550	550	550	550	570	600	630	660	690	720	750	780	810	840	870	900	930	960	990	1000	1000	1000	1000	1000	1000
10	550	550	550	550	570	600	630	660	690	720	750	780	810	840	870	900	930	960	990	1000	1000	1000	1000	1000	1000
9	550	550	550	550	570	600	630	660	690	720	750	780	810	840	870	900	930	960	990	1000	1000	1000	1000	1000	1000
8	550	550	550	550	570	600	630	660	690	720	750	780	810	840	870	900	930	960	990	1000	1000	1000	1000	1000	1000
7	550	550	550	550	570	600	630	660	690	720	750	780	810	840	870	900	930	960	990	1000	1000	1000	1000	1000	1000
6	550	550	550	550	570	600	630	660	690	720	750	780	810	840	870	900	930	960	990	1000	1000	1000	1000	1000	1000
5	550	550	550	550	570	600	630	660	690	720	750	780	810	840	870	900	930	960	990	1000	1000	1000	1000	1000	1000
4	550	550	550	550	570	600	630	660	690	720	750	780	810	840	870	900	930	960	990	1000	1000	1000	1000	1000	1000
3	550	550	550	550	570	600	630	660	690	720	750	780	810	840	870	900	930	960	990	1000	1000	1000	1000	1000	1000
2	550	550	550	550	570	600	630	660	690	720	750	780	810	840	870	900	930	960	990	1000	1000	1000	1000	1000	1000
1	550	550	550	550	570	600	630	660	690	720	750	780	810	840	870	900	930	960	990	1000	1000	1000	1000	1000	1000

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C*****APS00010
C*AP00020
C*AP00030
C*AP00040
C*AP00050
C*AP00060
C*AP00070
C*AP00080
C*AP00090
C*AP00100
C*AP00110
C*AP00120
C*AP00130
C*AP00140
C*AP00150
C*AP00160
C*AP00170
C*AP00180
C*AP00190
C*AP00200
C*AP00210
C*AP00220
C*AP00230
C*AP00240
C*AP00250
C*AP00260
C*AP00270
C*AP00280
C*AP00290
C*AP00300
C*AP00310
C*AP00320
C*AP00330
C*AP00340
C*AP00350
C*AP00360
C*AP00370
C*AP00380
C*AP00390
C*AP00400
C*AP00410
C*AP00420
C*AP00430
C*AP00440
C*AP00450
C*AP00460
C*AP00470
C*AP00480
C*AP00490
C*AP00500
C*AP00510
C*AP00520
C*AP00530
C*AP00540
C*AP00550
C*AP00560
C*AP00570
C*AP00580
C*AP00590
C*AP00600

THE ATMOSPHERIC POLLUTION SIMULATION PROGRAM

WRITTEN BY: STEVEN D. REYNOLDS

FOR

SYSTEMS APPLICATIONS, INC.,
9418 WILSHIRE BLVD.,
BEVERLY HILLS, CALIFORNIA 90212

JCL INFORMATION

REQUIRED

FT02F001 EMISSIONS DATA FILE
FT04F001 METEOROLOGICAL DATA FILE
FT05F001 CARD READER
FT06F001 PRINTER
FT07F001 CARD PUNCH
FT08F001 SCRATCH DISC/TAPE

OPTIONAL

FT03F001 SAVE AREA WHERE CONCENTRATIONS ARE TO
BE DUMPED AT THE END OF THE SIMULATION
FT09F001 SAVE AREA WHERE THE INITIAL CONCENTRATIONS ARE STORED

THE EMISSIONS DATA FILE IS DEFINED AS FOLLOWS (USING A 9 TRACK,
1600 BPI TAPE) :
C*FT02F001 DD UNIT=(TAPE16,,DEFER),LABEL=(1,BLP),DISP=(OLD,KEEP),
VOL=SER=EDF001,DCB=(RECFM=VS,LRECL=2504,BLKSIZE=2508)

THE METEOROLOGICAL DATA FILE IS DEFINED AS FOLLOWS (USING A 9
TRACK, 1600 BPI TAPE) :
C*FT04F001 DD UNIT=(TAPE16,,DEFER),LABEL=(1,BLP),DISP=(OLD,KEEP),
VOL=SER=MDF001,DCB=(RECFM=VS,LRECL=2504,BLKSIZE=2508)

THE SCRATCH DISC AREA IS DEFINED AS FOLLOWS :
C*FT08F001 DD UNIT=SYSSQ,SPACE=(TRK,(30,6)),DISP=(NEW,DELETE),
DCB=(RECFM=VS,LRECL=2504,BLKSIZE=2508)

THE OPTIONAL SAVE AREA WHERE THE CONCENTRATION FIELD IS DUMPED
AT THE END OF A SIMULATION IS DEFINED AS FOLLOWS (USING A SAVE
DISC AREA) :
C*FT03F001 DD UNIT=SYSDA,SPACE=(TRK,(13,2),RLSE),DISP=(NEW,KEEP),
DSN=SGR,SAVE=0001,DCB=(RECFM=VS,LRECL=2504,BLKSIZE=2508)

THE SAVE AREA WHERE THE INITIAL CONCENTRATIONS ARE STORED FOR
USE IN A PROGRAM RESTART IS DEFINED AS FOLLOWS (USING A SAVE
DISC AREA) :

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C*FT09F001 DD UNIT=SYSDA,DSN=SQR,SAVE0000,VOL=SER=CITSX1,
C* DISP=(OLD,KEEP)
C*
C*****
COMMON NOSPEC,NOX,NOY,NOZ,RESTRT,MPASS,DT,DELTAX,DELTAY,TOTIME,ALPAPS00650
1HA,BETA,GAMMA,EPS,ISPEC(6),NAME(6),RK(15),RKO(15),CONC(6,25,25,6) APS00660
COMMON /METDTA/ HORIG(25,25),DELTAM(25,25),WINDMG(25,25), APS00670
1 WINDAN(25,25),WX(26,26),WY(26,26),HIGH(27,27,2) APS00680
COMMON /BLCKEQ/ AA(6,4),BB(6,4,4),CC(6,4),YY(6,4),DC(6,4) APS00690
COMMON /SOUR/ NOPTS,MAXPTS,XPTS(15),YPTS(15),HEMIS(15),IJPTS(45), APS00700
1 PTEMIS(6,15),TEMPTS(15,24),QPTS(6,45),QOLD(6,25,25),QNEW(6,25,25) APS00710
COMMON /IOINFO/ FACTOR(6),UNIT(6),NOSTN,NOLAND,XSTN(16),YSTN(16), APS00720
1XLAND(8),YLAND(8),STNAME(16,5),LANDMK(8,5),TIMEZN APS00730
COMMON /BCOND/ ITOP(25),IBOTOM(25),ILEFT(25),IRIGHT(25),BC(6,25,4) APS00740
1 , CONCI(6,25,25) APS00750
COMMON /LINEQN/ A(30),B(10),C(10),X(10),Y(10) APS00760
REAL NOTE(40), NO,NO2,NO3,NAME,LANDMK,KXY,KZ(11) APS00770
DIMENSION CBARD(6),CBARN(6),CTOP(6),REGION(20),HOLD(4,10),CSTART APS00780
1 (6,10),Y1(6,3),YY1(6,4),R(4,4),RATE(4),FACTRK(24),CALOFT(6,25,25) APS00790
LOGICAL ISPEC,PUNCH,NORXN,DTCHNG,RESTRT,PSFLAG APS00800
DATA NORXN/,TRUE,/,DTCHNG/,FALSE,/,PSFLAG/,FALSE,/ APS00810
*** PARAMETER INITIALIZATION APS00820
KXY=3.2E4 APS00830
NOSPEC=6 APS00840
NORATE=15 APS00850
ITERN=0 APS00860
MAXPTS=0 APS00870
IJPTS(1)=0 APS00880
DTAVEC=60. APS00890
R(1,2)=0. APS00900
R(1,4)=0. APS00910
R(2,1)=0. APS00920
R(4,1)=0. APS00930
YSTN(1)=0. APS00940
YLAND(1)=0. APS00950
*** INPUT CARD NO. 1-9 APS00960
READ(5,105) NOTE APS00970
READ(5,100) PUNCH,RESTRT, NOX,NOY,NOZ,DT,DELTAX,DELTAY,PRDT APS00980
1 ,TSTART,TSTOP APS00990
READ(5,103) ISPEC,UNIT,FACTOR,TIMEZN APS01000
READ(5,105) REGION APS01010
READ(5,135) (ILEFT(J),J=1,NOY) APS01020
READ(5,135) (IRIGHT(J),J=1,NOY) APS01030
READ(5,135) NOSTN,NOLAND,NOPTS APS01040
IF(NOSTN.LE.0) GO TO 132 APS01050
READ(5,130) ((STNAME(I,J),J=1,5),XSTN(I),YSTN(I),I=1,NOSTN) APS01060
132 IF(NOLAND.LE.0) GO TO 133 APS01070
READ(5,130) ((LANDMK(I,J),J=1,5),XLAND(I),YLAND(I),I=1,NOLAND) APS01080
133 IF(NOPTS.LE.0) GO TO 116 APS01090
*** INPUT A SET OF CARD NO. 10-11 FOR EACH ELEVATED POINT SOURCE APS01100
DO 139 I=1,NOPTS APS01110
READ(5,101) XPTS(I),YPTS(I),HEMIS(I),(PTMIS(L,I),L=1,NOSPEC) APS01120
READ(5,138) (TEMPTS(I,J),J=1,24) APS01130
139 CONTINUE APS01140

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C		*** INPUT CARD NO. 12-15	APS01210
C			APS01220
C			APS01230
116		READ(5,115) MAXITR, RERROR, DTMIN, DTMAX, ALPHA, BETA, GAMMA, EPS, HTOP	APS01240
		READ(5,104) (RKO(I), I=1, NORATE)	APS01250
		READ(5,104) FACTRK	APS01260
		READ(5,105) NAME	APS01270
C			APS01280
C		*** INPUT CARD NO. 16	APS01290
C			APS01300
		DO 4 L=1, NOSPEC	APS01310
		IF(.NOT. ISPEC(L)) GO TO 4	APS01320
		DO 1 J=1, NOY	APS01330
1		READ(5,102) (CALOFT(L,I,J), I=1, NOX)	APS01340
4		CONTINUE	APS01350
C			APS01360
C		*** CONVERT CONCENTRATION UNITS TO PPM	APS01370
C			APS01380
		DO 7 L=1, NOSPEC	APS01390
		IF(L.EQ.3.OR..NOT. ISPEC(L)) GO TO 7	APS01400
		DO 9 I=1, NOX	APS01410
		DO 9 J=1, NOY	APS01420
		CALOFT(L,I,J)=CALOFT(L,I,J)/FACTOR(L)	APS01430
9		CONTINUE	APS01440
7		CONTINUE	APS01450
C			APS01460
C		*** DEFINE THE TOP (NORTH) AND BOTTOM (SOUTH) BORDERS	APS01470
C			APS01480
		DO 141 I=1, NOX	APS01490
		DO 142 JJ=1, NOY	APS01500
		J=NOY+1-JJ	APS01510
		ITOP(I)=J	APS01520
		IF(I.GE. ILEFT(J).AND. I.LE. IRIGHT(J)) GO TO 144	APS01530
142		CONTINUE	APS01540
144		DO 143 J=1, NOY	APS01550
		IBOTOM(I)=J	APS01560
		IF(I.GE. ILEFT(J).AND. I.LE. IRIGHT(J)) GO TO 141	APS01570
143		CONTINUE	APS01580
141		CONTINUE	APS01590
C			APS01600
C		*** DEFINE PROGRAM OPERATING PARAMETERS	APS01610
C			APS01620
		DELRHO=1./FLOAT(NOZ)	APS01630
		NOZM1=NOZ-1	APS01640
		DO 4004 K=1, NORATE	APS01650
4004		RK(K)=RKO(K)	APS01660
		TINTNX=INT(TSTART/100)*100 + 100.	APS01670
		IF(ISPEC(1)) NORXN=,FALSE,	APS01680
		TOTIME=TSTART	APS01690
		I=INT(TOTIME/100.)	APS01700
		PRTIME=I*100.	APS01710
		IF(PRTDT.LE.0.) GO TO 12	APS01720
13		IF(PRTIME.GT. TOTIME) GO TO 12	APS01730
		PRTIME=TIME(PRTIME, PRTDT, 1)	APS01740
		GO TO 13	APS01750
12		CONTINUE	APS01760
C			APS01770
C		*** PRINT THE FIRST PAGE OF PROGRAM OUTPUT	APS01780
C			APS01790
		WRITE(6,200) REGION, DELTAX, DELTAY, NOX, NOY, NOZ	APS01800

	WRITE(6,111) (I,RKO(I),I=1,NORATE)	APS01810
	WRITE(6,112) NOTE	APS01820
C		APS01830
C	*** INITIALIZE THE TIME INTEGRATED CONCENTRATION ARRAY	APS01840
C		APS01850
	CALL AVINIT	APS01860
C		APS01870
C	*** INITIALIZE METEOROLOGICAL PARAMETERS	APS01880
C		APS01890
	CALL METEOR	APS01900
C		APS01910
C	*** ESTABLISH THE INITIAL CONCENTRATION DISTRIBUTION	APS01920
C		APS01930
	CALL ICCONC	APS01940
C		APS01950
C	*** PRINT THE INITIAL GROUND LEVEL CONCENTRATIONS	APS01960
C		APS01970
	CALL PRINT1	APS01980
C		APS01990
C	*** INITIALIZE THE GROUND LEVEL EMISSION FLUXES	APS02000
C		APS02010
	CALL SOURCE	APS02020
	DTOLD=DT	APS02030
C		APS02040
C	*** SET THE ADVECTION INTEGRATION SEQUENCE VARIABLE - THIS	APS02050
C	COMPLETES THE INITIALIZATION OF THE PROGRAM	APS02060
C		APS02070
	ISEQ=2	APS02080
C		APS02090
C	*** CHECK TO SEE IF THE SIMULATION HAS BEEN COMPLETED	APS02100
C		APS02110
3	IF(TOTIME.GE.TSTOP) GO TO 1461	APS02120
	DT=DTOLD	APS02130
C		APS02140
C	*** SET THE ADVECTION INTEGRATION SEQUENCE PARAMETER	APS02150
C		APS02160
	ISEQ=IABS(ISEQ - 2) + 1	APS02170
	IF(NORXN) GO TO 4236	APS02180
C		APS02190
C	*** ALTER THE SIZE OF THE INTEGRATION TIME STEP IF NECESSARY	APS02200
		APS02210
	IF(.NOT.DTCHNG) GO TO 56	APS02220
	IF(ITERN.LE.2*NOX*NOY.AND.1TMAX.LT.10) GO TO 59	APS02230
	IF(ITERN.GT.ITERO) GO TO 55	APS02240
59	IF(1TMAX.GT.MAXITR/2) GO TO 56	APS02250
	DT=DT*1.15	APS02260
	IF(DT.GT.DTMAX) DT=DTMAX	APS02270
	GO TO 56	APS02280
55	DT=DT/1.15	APS02290
	IF(DT.LT.DTMIN) GO TO 1470	APS02300
C		APS02310
C	*** DUMP THE CONCENTRATION FIELD ONTO A SCRATCH AREA	APS02320
C		APS02330
56	REWIND 8	APS02340
	DO 1465 L=1,NOSPEC	APS02350
	IF(.NOT.ISPEC(L)) GO TO 1465	APS02360
	DO 1466 K=1,NOZ	APS02370
1466	WRITE(8) ((CONC(L,I,J,K),I=1,NOX),J=1,NOY)	APS02380
1465	CONTINUE	APS02390
	GO TO 4236	APS02400

*** THE NEXT SECTION OF CODE IS ENTERED WHENEVER A NEGATIVE
CONCENTRATION IS PREDICTED IN THE INTEGRATION PROCEDURE,
THE SIZE OF THE TIME STEP IS DECREASED, AND THE INTEGRATION
PROCEDURE IS REINITIATED.

1458 CONTINUE

*** DECREASE THE SIZE OF THE TIME STEP

C1=DT/1.3225

IF(C1.LT.DTMIN) GO TO 1470

*** REESTABLISH THE CONCENTRATION FIELD

REWIND 8

DO 1459 L=1,NOSPEC

IF(,NOT,ISPEC(L)) GO TO 1459

DO 1460 K=1,NQZ

1460 READ(8) ((CONC(L,I,J,K),I=1,NOX),J=1,NOY)

1459 CONTINUE

*** RESET THE TIME INTEGRATED CONCENTRATION ARRAY

MPASS=1

CALL CALIVC

ITERN=ITER0

TOTIME=TIME(TOTIME,DT,3)

DT=C1

4236 DTOLD=DT

*** INCREMENT TOTIME BY THE SIZE OF THE TIME STEP

TOTIME=TIME(TOTIME,DT,1)

I=INT(TOTIME/100.) + 1

*** CALCULATE VALUES OF THE PHOTOLYSIS RATE CONSTANTS

CONST2=FACTRK(I) + (TOTIME-(I-1)*100.)*(FACTRK(I+1)-FACTRK(I))/60.

RK(1)=CONST2*RKO(1)

RK(7)=CONST2*RKO(7)

*** UPDATE THE METEOROLOGICAL VARIABLES, GROUND LEVEL
EMISSION FLUXES, TIME INTEGRATED CONCENTRATIONS, AND
BOUNDARY CONCENTRATIONS

CALL METEOR

CALL SOURCE

MPASS=1

CALL CALIVC

CALL BCCONC

*** CALCULATE THE COORDINATES OF THE FIRST COLUMN OF GRID CELLS
INTO WHICH EMISSIONS FROM POINT SOURCES ARE TO BE DISTRIBUTED

IPTS=1

IPSNXT=IJPTS(IPTS)/100

JPSNXT=IJPTS(IPTS) - IPSNXT*100

NN=1

IF(ISEQ,EQ,2) GO TO 632

AP802410
AP802420
AP802430
AP802440
AP802450
AP802460
AP802470
AP802480
AP802490
AP802500
AP802510
AP802520
AP802530
AP802540
AP802550
AP802560
AP802570
AP802580
AP802590
AP802600
AP802610
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AP802630
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AP802660
AP802670
AP802680
AP802690
AP802700
AP802710
AP802720
AP802730
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AP802750
AP802760
AP802770
AP802780
AP802790
AP802800
AP802810
AP802820
AP802830
AP802840
AP802850
AP802860
AP802870
AP802880
AP802890
AP802900
AP802910
AP802920
AP802930
AP802940
AP802950
AP802960
AP802970
AP802980
AP802990
AP803000

C		APS03010
C	*** STEP 1. INTEGRATION IN THE X DIRECTION	APS03020
C		APS03030
612	C1=DT/DELTAX	APS03040
	GAM=KXY*DT/(DELTAX*DELTAX)	APS03050
	ISTEP=1	APS03060
	DO 302 L=1,NOSPEC	APS03070
	IF(.NOT.ISPEC(L)) GO TO 302	APS03080
	DO 300 K=1,NOZ	APS03090
	DO 304 J=1,NOY	APS03100
	I=ILEFT(J)	APS03110
	ALP=0.5*C1*X(I,J)*(HIGH(I,J+1,MM)+HIGH(I+1,J+1,MM))	APS03120
	IF(ALP.LT.0.) GO TO 320	APS03130
	FLUX1=ALP*BC(L,J,4)	APS03140
	GO TO 321	APS03150
320	IF(IRIGHT(J).EQ.I) GO TO 322	APS03160
	FLUX1=ALP*(3.*CONC(L,I,J,K)-CONC(L,I+1,J,K))/2.	APS03170
	GO TO 321	APS03180
322	FLUX1=ALP*CONC(L,I,J,K)	APS03190
321	H=0.5*(HIGH(I+1,J+1,MM)+HIGH(I+2,J+1,MM))	APS03200
	ALP=C1*H*X(I+1,J)	APS03210
323	IF(I.EQ.IRIGHT(J)) GO TO 330	APS03220
	IF(ALP.LT.0.) GO TO 325	APS03230
	IF(WX(I,J).LE.0.) GO TO 324	APS03240
	FLUX2=ALP*(3.*CONC(L,I,J,K)-BC(L,J,4))/2.+H*GAM*(CONC(L,I,J,K)-CONC(L,I+1,J,K))	APS03250
	GO TO 326	APS03260
324	FLUX2=ALP*CONC(L,I,J,K) + H*GAM*(CONC(L,I,J,K)-CONC(L,I+1,J,K))	APS03270
	GO TO 326	APS03280
325	IF(IRIGHT(J)-I.LE.1) GO TO 331	APS03290
	FLUX2=ALP*(3.*CONC(L,I+1,J,K)-CONC(L,I+2,J,K))/2. + GAM*H*(CONC(L,I+1,J,K)-CONC(L,I+1,J,K))	APS03300
326	A(I)=CONC(L,I,J,K) + (FLUX1-FLUX2)/HIGH(I+1,J+1,MM)	APS03310
	IF(A(I).LT.0.) GO TO 1458	APS03320
	ISTART=I+1	APS03330
	ISTOP=IRIGHT(J)-2	APS03340
	IF(ISTOP.LT.ISTART) GO TO 327	APS03350
336	DO 308 I=ISTART,ISTOP	APS03360
	FLUX1=FLUX2	APS03370
	H=0.5*(HIGH(I+1,J+1,MM)+HIGH(I+2,J+1,MM))	APS03380
	ALP=C1*H*X(I+1,J)	APS03390
1661	IF(ALP.LT.0.) GO TO 301	APS03400
	FLUX2=ALP*(3.*CONC(L,I,J,K)-CONC(L,I-1,J,K))/2. +H*GAM*(CONC(L,I,J,K)-CONC(L,I+1,J,K))	APS03410
	GO TO 307	APS03420
301	FLUX2=ALP*(3.*CONC(L,I+1,J,K)-CONC(L,I+2,J,K))/2. +H*GAM*(CONC(L,I+1,J,K)-CONC(L,I+1,J,K))	APS03430
307	A(I)=CONC(L,I,J,K) + (FLUX1-FLUX2)/HIGH(I+1,J+1,MM)	APS03440
	IF(A(I).GE.0.) GO TO 308	APS03450
	GO TO 1458	APS03460
308	CONTINUE	APS03470
327	FLUX1=FLUX2	APS03480
	I=IRIGHT(J)-1	APS03490
	H=0.5*(HIGH(I+1,J+1,MM)+HIGH(I+2,J+1,MM))	APS03500
	ALP=C1*H*X(I+1,J)	APS03510
341	IF(ALP.LT.0.) GO TO 331	APS03520
	FLUX2=ALP*(3.*CONC(L,I,J,K)-CONC(L,I-1,J,K))/2.+GAM*H*(CONC(L,I,J,K)-CONC(L,I+1,J,K))	APS03530
	GO TO 332	APS03540
331	IF(WX(I+2,J).GE.0.) GO TO 337	APS03550
		APS03560
		APS03570
		APS03580
		APS03590
		APS03600

	FLUX2=ALP*(3.*CONC(L,I+1,J,K)-BC(L,J,3))/2.+H*GAM*(CONC(L,I,J,K)-	APS03610
	1 CONC(L,I+1,J,K))	APS03620
	GO TO 332	APS03630
337	FLUX2=ALP*CONC(L,I+1,J,K) + H*GAM*(CONC(L,I,J,K)-CONC(L,I+1,J,K))	APS03640
332	A(I)=CONC(L,I,J,K) + (FLUX1-FLUX2)/HIGH(I+1,J+1,MM)	APS03650
	IF(A(I).LT.0.) GO TO 1458	APS03660
335	FLUX1=FLUX2	APS03670
	I=IRIGHT(J)	APS03680
	H=0.5*(HIGH(I+1,J+1,MM)+HIGH(I+2,J+1,MM))	APS03690
	ALP=H*C1*WX(I+1,J)	APS03700
330	IF(ALP.LT.0.) GO TO 333	APS03710
	IF(IRIGHT(J).EQ.ILEFT(J)) GO TO 338	APS03720
	FLUX2=ALP*(3.*CONC(L,I,J,K)-CONC(L,I-1,J,K))/2,	APS03730
	GO TO 334	APS03740
338	FLUX2=ALP*CONC(L,I,J,K)	APS03750
	GO TO 334	APS03760
333	FLUX2=ALP*BC(L,J,3)	APS03770
334	CONC(L,I,J,K)=CONC(L,I,J,K) + (FLUX1-FLUX2)/HIGH(I+1,J+1,MM)	APS03780
	IF(CONC(L,I,J,K).GE.0.) GO TO 339	APS03790
	A(I)=CONC(L,I,J,K)	APS03800
	GO TO 1458	APS03810
339	ISTART=ILEFT(J)	APS03820
	ISTOP=IRIGHT(J)-1	APS03830
	IF(ISTOP.LT.ISTART) GO TO 304	APS03840
	DO 310 I=ISTART,ISTOP	APS03850
310	CONC(L,I,J,K)=A(I)	APS03860
304	CONTINUE	APS03870
300	CONTINUE	APS03880
302	CONTINUE	APS03890
	IF(ISEQ,EO,2) GO TO 609	APS03900
C		APS03910
C	*** STEP II. INTEGRATION IN THE Y DIRECTION	APS03920
C		APS03930
632	C1=DT/DELTAY	APS03940
	GAM=KXY*DT/(DELTAY*DELTAY)	APS03950
	ISTEP=2	APS03960
	DO 402 L=1,NOSPEC	APS03970
	IF(.NOT.ISPEC(L)) GO TO 402	APS03980
	DO 400 K=1,N0Z	APS03990
	DO 404 I=1,N0X	APS04000
	J=IBOTOM(I)	APS04010
	ALP=0.5*C1*WY(I,J)*(HIGH(I+1,J,MM)+HIGH(I+1,J+1,MM))	APS04020
	IF(ALP.LT.0.) GO TO 420	APS04030
	FLUX1=ALP*BC(L,I,2)	APS04040
	GO TO 421	APS04050
420	IF(ITOP(I).EQ.J) GO TO 422	APS04060
	FLUX1=ALP*(3.*CONC(L,I,J,K)-CONC(L,I,J+1,K))/2,	APS04070
	GO TO 421	APS04080
422	FLUX1=ALP*CONC(L,I,J,K)	APS04090
421	H=0.5*(HIGH(I+1,J+1,MM)+HIGH(I+1,J+2,MM))	APS04100
	ALP=C1*H*WY(I,J+1)	APS04110
423	IF(J.EQ.ITOP(I)) GO TO 430	APS04120
	IF(ALP.LT.0.) GO TO 425	APS04130
	IF(WY(I,J).LE.0.) GO TO 424	APS04140
	FLUX2=ALP*(3.*CONC(L,I,J,K)-BC(L,I,2))/2.+H*GAM*(CONC(L,I,J,K)-	APS04150
	1 CONC(L,I,J+1,K))	APS04160
	GO TO 426	APS04170
424	FLUX2=ALP*CONC(L,I,J,K) + H*GAM*(CONC(L,I,J,K)-CONC(L,I,J+1,K))	APS04180
	GO TO 426	APS04190
425	IF(ITOP(I)-J.LE.1) GO TO 431	APS04200

	FLUX2=ALP*(3.*CONC(L,I,J+1,K)=CONC(L,I,J+2,K))/2,+GAM*H*(CONC(L,I,	APS04210
	1 J,K)=CONC(L,I,J+1,K))	APS04220
426	A(J)=CONC(L,I,J,K) + (FLUX1=FLUX2)/HIGH(I+1,J+1,MM)	APS04230
	IF(A(J),LT,0.) GO TO 1458	APS04240
	JSTART=J+1	APS04250
	JSTOP=ITOP(I)=2	APS04260
	IF(JSTOP,LT,JSTART) GO TO 427	APS04270
436	DO 408 J=JSTART,JSTOP	APS04280
	FLUX1=FLUX2	APS04290
	H=0.5*(HIGH(I+1,J+1,MM)+HIGH(I+1,J+2,MM))	APS04300
	ALP=C1*H*WY(I,J+1)	APS04310
1761	IF(ALP,LT,0.) GO TO 401	APS04320
	FLUX2=ALP*(3.*CONC(L,I,J,K)=CONC(L,I,J-1,K))/2,+H*GAM*(CONC(L,I,J,	APS04330
	1 K)=CONC(L,I,J+1,K))	APS04340
	GO TO 407	APS04350
401	FLUX2=ALP*(3.*CONC(L,I,J+1,K)=CONC(L,I,J+2,K))/2,+H*GAM*(CONC(L,I,	APS04360
	1 J,K)=CONC(L,I,J+1,K))	APS04370
407	A(J)=CONC(L,I,J,K) + (FLUX1=FLUX2)/HIGH(I+1,J+1,MM)	APS04380
	IF(A(J),GE,0.) GO TO 408	APS04390
	GO TO 1458	APS04400
408	CONTINUE	APS04410
427	FLUX1=FLUX2	APS04420
	J=ITOP(I)=1	APS04430
	H=0.5*(HIGH(I+1,J+1,MM)+HIGH(I+1,J+2,MM))	APS04440
	ALP=C1*H*WY(I,J+1)	APS04450
441	IF(ALP,LT,0.) GO TO 431	APS04460
	FLUX2=ALP*(3.*CONC(L,I,J,K)=CONC(L,I,J-1,K))/2, +GAM*H*(CONC(L,I,J,	APS04470
	1 ,K)=CONC(L,I,J+1,K))	APS04480
	GO TO 432	APS04490
431	IF(WY(I,J+2),GE,0.) GO TO 437	APS04500
	FLUX2=ALP*(3.*CONC(L,I,J+1,K)=HC(L,I,1))/2, +H*GAM*(CONC(L,I,J,K)=	APS04510
	1 CONC(L,I,J+1,K))	APS04520
	GO TO 432	APS04530
437	FLUX2=ALP*CONC(L,I,J+1,K) + H*GAM*(CONC(L,I,J,K)=CONC(L,I,J+1,K))	APS04540
432	A(J)=CONC(L,I,J,K) + (FLUX1=FLUX2)/HIGH(I+1,J+1,MM)	APS04550
	IF(A(J),LT,0.) GO TO 1458	APS04560
435	FLUX1=FLUX2	APS04570
	J=ITOP(I)	APS04580
	H=0.5*(HIGH(I+1,J+1,MM)+HIGH(I+1,J+2,MM))	APS04590
	ALP=H*C1*WY(I,J+1)	APS04600
430	IF(ALP,LT,0.) GO TO 433	APS04610
	IF(ITOP(I),EQ,IBOTOM(I)) GO TO 438	APS04620
	FLUX2=ALP*(3.*CONC(L,I,J,K)=CONC(L,I,J-1,K))/2,	APS04630
	GO TO 434	APS04640
438	FLUX2=ALP*CONC(L,I,J,K)	APS04650
	GO TO 434	APS04660
433	FLUX2=ALP*BC(L,I,1)	APS04670
434	CONC(L,I,J,K)=CONC(L,I,J,K) + (FLUX1=FLUX2)/HIGH(I+1,J+1,MM)	APS04680
	IF(CONC(L,I,J,K),GE,0.) GO TO 439	APS04690
	A(J)=CONC(L,I,J,K)	APS04700
	GO TO 1458	APS04710
439	JSTART=IBOTOM(I)	APS04720
	JSTOP=ITOP(I)=1	APS04730
	IF(JSTOP,LT,JSTART) GO TO 404	APS04740
	DO 410 J=JSTART,JSTOP	APS04750
410	CONC(L,I,J,K)=A(J)	APS04760
404	CONTINUE	APS04770
400	CONTINUE	APS04780
402	CONTINUE	APS04790
	IF(ISEQ,EQ,2) GO TO 612	APS04800

	*** STEP III. INTEGRATION IN THE Z DIRECTION	AP304810
C		AP304820
609	IF(NORXN) GO TO 613	AP304830
	DTCHNG=.FALSE.	AP304840
	IF(ISEQ,EQ,2) DTCHNG=.TRUE.	AP304850
C		AP304860
C	*** SET ITERATION COUNTERS AND RATE CONSTANT ARRAY	AP304870
C		AP304880
	ITERO=ITERN	AP304890
	ITERN=0	AP304900
	ITMAX=0	AP304910
	DO 614 K=1,NORATE	AP304920
614	RK(K)=0.5*DT*RK0(K)	AP304930
		AP304940
C		AP304950
C	*** CALCULATE PHOTOLYSIS RATE CONSTANTS	AP304960
C		AP304970
	I=INT(TOTIME/100.) + 1	AP304980
	CONST2=FACTRK(I) + (TOTIME-(I-1)*100.)*(FACTRK(I+1)-FACTRK(I))/60.	AP304990
	RK(1)=CONST2*RK0(1)*0.5*DT	AP305000
	RK(7)=CONST2*RK0(7)*0.5*DT	AP305010
C		AP305020
C	*** CALCULATE OZONE CONCENTRATIONS ALOFT	AP305030
C		AP305040
	DO 6 I=1,NUX	AP305050
	DO 6 J=1,NVY	AP305060
6	CALOFT(3,I,J)=RK(1)*CALOFT(4,I,J)/(RK(3)*CALOFT(2,I,J))	AP305070
613	ISTEP=3	AP305080
	DO 2006 I=1,NUX	AP305090
	JSTART=IBOTOM(I)	AP305100
	JSTOP=ITOP(I)	AP305110
	DO 2007 J=JSTART,JSTOP	AP305120
C		AP305130
C	*** CHECK FOR EMISSIONS FROM ELEVATED POINT SOURCES INTO THE	AP305140
C	PRESENT COLUMN OF GRID CELLS	AP305150
C		AP305160
	IF(I,EQ,IPSNXT,AND,J,EQ,JPSNXT) PSFLAG=.TRUE.	AP305170
	C1=0.5*DT/(DFLRMO*HIGH(I+1,J+1,2))	AP305180
C		AP305190
C	*** CALCULATE OLD AND NEW VALUES OF THE TOTAL VERTICAL ADVECTIVE	AP305200
C	VELOCITY AT THE INVERSION BASE	AP305210
C		AP305220
	WZ0=0.5*((WX(I,J)*(HIGH(I,J+1,1)+HIGH(I+1,J+1,1))-WX(I+1,J)*(HIGH(I+1,J+1,1)+HIGH(I+2,J+1,1)))/DELTAX + (WY(I,J)*(HIGH(I+1,J,1)+HIGH(I+1,J+1,1))-WY(I+1,J)*(HIGH(I+1,J,1)+HIGH(I+1,J+1,1)))/DELTAY)	AP305230
	1 = DELTAM(I,J)	AP305240
	WZ4=0.5*((WX(I,J)*(HIGH(I,J+1,2)+HIGH(I+1,J+1,2))-WX(I+1,J)*(HIGH(I+1,J+1,2)+HIGH(I+2,J+1,2)))/DELTAX + (WY(I,J)*(HIGH(I+1,J,2)+HIGH(I+1,J+1,2))-WY(I+1,J)*(HIGH(I+1,J,2)+HIGH(I+1,J+1,2)))/DELTAY)	AP305250
	1 = DELTAM(I,J)	AP305260
	IF(4ZN,GE,0.) GO TO 685	AP305270
		AP305280
		AP305290
		AP305300
		AP305310
C		AP305320
C	*** CALCULATE CONCENTRATIONS JUST ABOVE THE INVERSION BASE	AP305330
C		AP305340
	DO 686 L=1,NOSPEC	AP305350
	IF(.NOT.ISPEC(L)) GO TO 686	AP305360
	CTOP(L)=CALOFT(L,I,J)	AP305370
	DO 688 M=1,2	AP305380
	IF(HIGH(I+1,J+1,M),GE,HTOP) GO TO 687	AP305390
	A(M)=CONCI(L,I,J)+(HIGH(I+1,J+1,M)-HORIG(I,J))*(CTOP(L)-CONCI(L,I,J))	AP305400

	1 J))/ (HTOP=HORIZ(I,J))	APS05410
	GO TO 688	APS05420
687	A(M)=CTOP(L)	APS05430
688	CONTINUE	APS05440
	CBARO(L)=A(1)	APS05450
	CBARN(L)=A(2)	APS05460
	IF(L,NE,4) GO TO 686	APS05470
C		APS05480
C	*** CALCULATE THE OZONE CONCENTRATIONS ALOFT FROM THE STEADY	APS05490
C	STATE RELATIONSHIP	APS05500
		APS05510
	CBARO(3)=RK(1)*CBARO(4)/(RK(3)*CBARO(2))	APS05520
	CBARN(3)=RK(1)*CBARN(4)/(RK(3)*CBARN(2))	APS05530
686	CONTINUE	APS05540
685	WZU=WZU*DT/(4.*HIGH(I+1,J+1,2))	APS05550
	WZN=WZN*DT/(4.*HIGH(I+1,J+1,2))	APS05560
	H1=HIGH(I+1,J+1,1)/HIGH(I+1,J+1,2)	APS05570
	D1=0.5*DT/(DELRHO*DELRHO*HIGH(I+1,J+1,1)*HIGH(I+1,J+1,2))	APS05580
	D2=0.5*DT/(DELRHO*DELRHO*HIGH(I+1,J+1,2)*HIGH(I+1,J+1,2))	APS05590
C		APS05600
C	*** OBTAIN THE VERTICAL TURBULENT DIFFUSIVITY	APS05610
C		APS05620
	CALL DIFCOF(I,J,KZ)	APS05630
C		APS05640
C	*** SET UP THE BANDS OF THE TRIDIAGONAL MATRIX (A,B,C) AND THE	APS05650
C	UTILITY MATRIX Y1	APS05660
		APS05670
	B(1)=1. + WZN + KZ(2)*D2	APS05680
	C(1)=WZN - KZ(2)*D2	APS05690
	Y1(1,2)=H1 - WZN - KZ(2)*D1	APS05700
	Y1(1,3)=D1*KZ(2) - WZN	APS05710
	DO 5001 K=2,NOZM1	APS05720
	Y1(K,1)=(K-1)*WZN + D1*KZ(K)	APS05730
	Y1(K,2)=H1 - WZN - D1*(KZ(K) + KZ(K+1))	APS05740
	Y1(K,3)=D1*KZ(K+1) - K*WZN	APS05750
	A(K)=WZN*(K-1) - KZ(K)*D2	APS05760
	B(K)=1. + WZN + D2*(KZ(K)+KZ(K+1))	APS05770
5001	C(K)=K*WZN - KZ(K+1)*D2	APS05780
	A(NOZ)=WZN*NOZM1 - KZ(NOZ)*D2	APS05790
	B(NOZ)=1. - WZN*NOZM1 + KZ(NOZ)*D2	APS05800
	Y1(NOZ,1)=NOZM1*WZN + D1*KZ(NOZ)	APS05810
	Y1(NOZ,2)=H1 + NOZM1*WZN - D1*KZ(NOZ)	APS05820
	IF(WZN,LT,0.) GO TO 615	APS05830
	B(NOZ)=B(NOZ) + 2*NOZ*WZN	APS05840
	Y1(NOZ,2)=Y1(NOZ,2) - 2*NOZ*WZN	APS05850
615	DO 5015 L=5,NO8PEC	APS05860
	IF(.NOT.ISPEC(L)) GO TO 5015	APS05870
C		APS05880
C	*** FINISH DEFINING THE TRIDIAGONAL SYSTEM FOR THE INERT	APS05890
C	SPECIES	APS05900
		APS05910
	Y(1)=CONC(L,I,J,1)*Y1(1,2) + CONC(L,I,J,2)*Y1(1,3) + C1*(QOLD(L,I,	APS05920
	1 J) + QNEW(L,I,J))	APS05930
	DO 5002 K=2,NOZM1	APS05940
5002	Y(K)=CONC(L,I,J,K-1)*Y1(K,1) + CONC(L,I,J,K)*Y1(K,2) + CONC(L,I,J,	APS05950
	1 K+1)*Y1(K,3)	APS05960
	Y(NOZ)=CONC(L,I,J,NOZM1)*Y1(NOZ,1) + CONC(L,I,J,NOZ)*Y1(NOZ,2)	APS05970
	IF(WZN,LT,0.) Y(NOZ)=Y(NOZ) - 2*NOZ*(WZN*CBARN(L)+WZO*CBARO(L))	APS05980
	IF(.NOT.PSFLAG) GO TO 5014	APS05990
	C2=DT*OPTS(L,IPTS)/HIGH(I+1,J+1,2)	APS06000

DO 5588 K=1,NOZ	APS06010
588 Y(K)=Y(K) + C2	APS06020
C	APS06030
C *** SOLVE THE TRIDIAGONAL SYSTEM OF LINEAR EQUATIONS	APS06040
C	APS06050
5014 CALL SIMDIG(NOZ)	APS06060
DO 5011 K=1,NOZ	APS06070
5011 CONC(L,I,J,K)=X(K)	APS06080
5015 CONTINUE	APS06090
C	APS06100
C *** IF ONLY INERT SPECIES ARE BEING SIMULATED, THEN MOVE ON	APS06110
C TO THE NEXT VERTICAL COLUMN OF GRID CELLS	APS06120
C	APS06130
IF(NORXN) GO TO 2008	APS06140
DO 2002 L=1,4	APS06150
C	APS06160
C *** CALCULATE THE OFF-DIAGONAL BANDS OF THE BLOCK TRIDIAGONAL	APS06170
C MATRIX, THE UTILITY MATRIX YY1, AND THE TAYLOR SERIES	APS06180
C ESTIMATE OF THE SOLUTION OF THE NONLINEAR EQUATIONS, CSTART	APS06190
C	APS06200
DO 616 K=1,NOZ	APS06210
AA(K,L)=A(K)	APS06220
CC(K,L)=C(K)	APS06230
616 HOLD(L,K)=CONC(L,I,J,K)	APS06240
YY1(1,L)=HOLD(L,1)*Y1(1,2) + HOLD(L,2)*Y1(1,3) + C1*(GOLD(L,I,J) +	APS06250
1 QNEW(L,I,J))	APS06260
CSTART(L,1)=2.*YY1(1,L) - C1*(GOLD(L,I,J)+QNEW(L,I,J))-H1*HOLD(L,1)	APS06270
DO 2009 K=2,NOZM1	APS06280
YY1(K,L)=HOLD(L,K-1)*Y1(K,1) + HOLD(L,K)*Y1(K,2) + HOLD(L,K+1)*	APS06290
1 Y1(K,3)	APS06300
2009 CSTART(L,K)=2.*YY1(K,L) - H1*HOLD(L,K)	APS06310
YY1(NOZ,L)=HOLD(L,NOZM1)*Y1(NOZ,1) + HOLD(L,NOZ)*Y1(NOZ,2)	APS06320
IF(WZN.LT.0.) GO TO 5020	APS06330
CSTART(L,NOZ)=2.*YY1(NOZ,L) - H1*HOLD(L,NOZ)	APS06340
GO TO 2004	APS06350
5020 YY1(NOZ,L)=YY1(NOZ,L) - 2.*NOZ*(WZN*CBARN(L)+WZO*CBARO(L))	APS06360
CSTART(L,NOZ)=2.*YY1(NOZ,L)+2*NOZ*(WZN*CBARN(L)+CBARO(L)*WZO) -	APS06370
1 H1*HOLD(L,NOZ)	APS06380
2004 IF(.NOT.PSFLAG) GO TO 2002	APS06390
C2=DT*QPTS(L,IPTS)/HIGH(I+1,J+1,2)	APS06400
DO 5021 K=1,NOZ	APS06410
CSTART(L,K)=CSTART(L,K) + C2	APS06420
5021 YY1(K,L)=YY1(K,L) + C2	APS06430
2002 CONTINUE	APS06440
ASSIGN 1210 TO JSEQ	APS06450
ITER=1	APS06460
1211 DO 8161 K=1,NOZ	APS06470
HC=HOLD(1,K)	APS06480
NO=HOLD(2,K)	APS06490
O3=HOLD(3,K)	APS06500
NO2=HOLD(4,K)	APS06510
CO=CONC(5,I,J,K)	APS06520
C	APS06530
C *** CALCULATE THE CONCENTRATIONS OF THE STEADY STATE SPECIES	APS06540
C	APS06550
C3=2.*RK(6)*NO*NO2	APS06560
O=RK(1)*NO2/(RK(2)+RK(11)*HC)	APS06570
NO3=RK(4)*O3/RK(5)	APS06580
RO2=(HC*(ALPHA*RK(11)+O+GAMMA*RK(13)*O3) +BETA*C3)/(RK(14)*NO*(1,-	APS06590
1BETA*EP8)+RK(15)*NO2)	APS06600

	OH=(EPS*RK(14)*NO*RO2 + C3)/(RK(12)*HC)	APS06610
	H02=RK(8)*C0*OH/(RK(9)*NO+RK(10)*NO2)	APS06620
	HND2=(C3+RK(10)*H02*NO2)/RK(7)	APS06630
C		APS06640
C	*** CALCULATE THE ARRAY R(I,J), WHERE R(I,J) IS MINUS ONE TIMES	APS06650
C	THE PARTIAL DERIVATIVE OF THE CHEMICAL REACTION RATE	APS06660
C	EXPRESSION FOR SPECIES I WITH RESPECT TO THE CONCENTRATION	APS06670
C	OF SPECIES J, ALSO CALCULATE THE RATE OF CHEMICAL REACTION	APS06680
C	FOR SPECIES I, RATE(I)	APS06690
		APS06700
	R(3,1)=RK(13)*O3	APS06710
	R(1,1)=R(3,1) + RK(11)*O + RK(12)*OH	APS06720
	R(3,2)=RK(3)*N3	APS06730
	R(4,2)=R(3,2) - RK(9)*H02 - RK(14)*RO2	APS06740
	R(2,2)=RK(6)*NO2 - R(4,2)	APS06750
	R(1,3)=RK(13)*HC	APS06760
	R(2,3)=RK(3)*NO	APS06770
	R(3,3)=RK(4)*NO2	APS06780
	R(4,3)=R(3,3) - R(2,3)	APS06790
	R(3,3)=R(3,3) + R(2,3) + R(1,3)	APS06800
	R(2,4)=RK(6)*NO	APS06810
	R(3,4)=RK(4)*N3	APS06820
	R(4,4)=R(3,4) + R(2,4) + RK(5)*NO3 + RK(10)*H02 + RK(15)*RO2+RK(1)	APS06830
	R(2,4)=R(2,4) - RK(1)	APS06840
	RATE(1)=HC*R(1,1)	APS06850
	RATE(2)=RK(1)*NO2 + RK(7)*HND2 - NO*R(2,2)	APS06860
	RATE(3)=RK(2)*O - O3*R(3,3)	APS06870
	RATE(4)=NO*R(4,2) - NO2*R(4,4)	APS06880
	R(4,2)=R(4,2) + RK(6)*NO2	APS06890
	GO TO JSEQ,(1210,8163)	APS06900
1210	DO 8162 L=1,4	APS06910
	YY1(K,L)=YY1(K,L) + H1*RATE(L)	APS06920
	HOLD(L,K)=CSTART(L,K) + 2.*H1*RATE(L)	APS06930
	IF(HOLD(L,K).LT.0.) HOLD(L,K)=CONC(L,I,J,K)	APS06940
8162	CONTINUE	APS06950
	GO TO 8161	APS06960
C		APS06970
C	*** CALCULATE THE DIAGONAL BLOCKS OF THE BLOCK TRIDIAGONAL	APS06980
C	MATRIX AND THE RIGHT HAND SIDE	APS06990
C		APS07000
8163	DO 8164 II=1,4	APS07010
	DO 8165 JJ=1,4	APS07020
8165	BB(K,II,JJ)=R(II,JJ)	APS07030
	BB(K,II,II)=BB(K,II,II) + B(K)	APS07040
8164	YY(K,II)=YY1(K,II) + RATE(II)	APS07050
8161	CONTINUE	APS07060
	ASSIGN 8163 TO JSEQ	APS07070
	IF(ITER.GE.0) GO TO 2120	APS07080
	ITER=0	APS07090
	GO TO 1211	APS07100
2120	DO 1212 L=1,4	APS07110
	YY(1,L)=YY(1,L) - B(1)*HOLD(L,1) - C(1)*HOLD(L,2)	APS07120
	DO 2013 K=2,NOZM1	APS07130
2013	YY(K,L)=YY(K,L) - A(K)*HOLD(L,K-1)-B(K)*HOLD(L,K)-C(K)*HOLD(L,K+1)	APS07140
	YY(NOZ,L)=YY(NOZ,L) - A(NOZ)*HOLD(L,NOZM1)-B(NOZ)*HOLD(L,NOZ)	APS07150
1212	CONTINUE	APS07160
C		APS07170
C	*** SOLVE THE BLOCK TRIDIAGONAL SYSTEM OF LINEAR EQUATIONS	APS07180
	CALL BLCKTD(NOZ,4)	APS07190
		APS07200

ITER=ITER+1	APS07210
*** CHECK TO SEE IF THE RELATIVE CHANGE IN THE CONCENTRATIONS IS LESS THAN THE RELATIVE ERROR TOLERANCE RERROR	APS07220
DO 2114 L=1,4	APS07230
DO 2114 K=1,NQZ	APS07240
ERR=ABS(HOLD(L,K))	APS07250
IF(ERR.GT.1.0E-20) ERR=ABS(DC(K,L)/HOLD(L,K))	APS07260
IF(ERR.GT.RERROR) GO TO 1216	APS07270
2114 CONTINUE	APS07280
IF(ITER.GT.ITHAX) ITHAX=ITER	APS07290
ITERN=ITERN+ITER	APS07300
ASSIGN 618 TO KSEQ	APS07310
GO TO 2115	APS07320
*** STATEMENT 1216 IS ENTERED WHEN THE ITERATIVE PROCEDURE HAS NOT YET CONVERGED SUFFICIENTLY	APS07330
1216 ASSIGN 1211 TO KSEQ	APS07340
IF(ITER.GT.MAXITR) GO TO 1458	APS07350
2115 DO 2116 L=1,4	APS07360
DO 2116 K=1,NQZ	APS07370
HOLD(L,K)=HOLD(L,K) + DC(K,L)	APS07380
IF(HOLD(L,K).GE.0.) GO TO 2116	APS07390
*** IF A NEGATIVE CONCENTRATION IS PREDICTED, THEN CONTROL IS PASSED TO STATEMENT 1458 WHERE THE TIME STEP SIZE IS DECREASED AND THE INTEGRATION PROCEDURE IS REINITIALIZED	APS07400
GO TO 1458	APS07410
2116 CONTINUE	APS07420
GO TO KSEQ,(1211,618)	APS07430
618 DO 617 L=1,4	APS07440
DO 617 K=1,NQZ	APS07450
617 CONC(L,I,J,K)=HOLD(L,K)	APS07460
2008 IF(,NOT,PSFLAG) GO TO 2007	APS07470
*** CALCULATE THE COORDINATES OF THE NEXT VERTICAL COLUMN OF GRID CELLS TO RECEIVE EMISSIONS FROM ELEVATED POINT SOURCES	APS07480
IPTS=IPTS+1	APS07490
IF(IPTS.GT.MAXPTS) IPTS=1	APS07500
IPSNXT=IJPTS(IPTS)/100	APS07510
JPSNXT=IJPTS(IPTS) - 100*IPSNXT	APS07520
PSFLAG=,FALSE.	APS07530
2007 CONTINUE	APS07540
2006 CONTINUE	APS07550
*** INCREMENT THE TIME INTEGRATED CONCENTRATION ARRAY, CALCULATE TIME AVERAGED CONCENTRATIONS (IF NECESSARY), AND PRINT THE INSTANTANEOUS CONCENTRATIONS (IF NECESSARY)	APS07560
650 MPASS=2	APS07570
CALL CALIVC	APS07580
IF(TOTIME,LT,TINTNX) GO TO 409	APS07590
TINTNX=TIME(TINTNX,DTAVEC,1)	APS07600
CALL AVCONC	APS07610
409 IF(PRTIME,GT,TOTIME) GO TO 3	APS07620
PRTIME=TIME(PRTIME,PRTOT,1)	APS07630
	APS07640
	APS07650
	APS07660
	APS07670
	APS07680
	APS07690
	APS07700
	APS07710
	APS07720
	APS07730
	APS07740
	APS07750
	APS07760
	APS07770
	APS07780
	APS07790
	APS07800


```

CALL PRINT1
*** CYCLE BACK TO TAKE ANOTHER TIME STEP
GO TO 3
*** IN THE NEXT SECTION OF CODE, SELECTED ELEMENTS OF VARIOUS
    ARRAYS ARE PRINTED BEFORE THE PROGRAM TERMINATES
1470 WRITE(6,1485) NAME(L),ISTEP,I,J,K
    GO TO (1471,1472,1473),ISTEP
1471 ISTART=ILEFT(J)
    ISTOP=IRIGHT(J)
    WRITE(6,1486) L,J,BC(L,J,3),L,J,BC(L,J,4)
    WRITE(6,1484) (II,A(II),II=ISTART,I)
    WRITE(6,1482)
    WRITE(6,1483) (L,II,J,K,CONC(L,II,J,K),II=ISTART,ISTOP)
    STOP
1472 ISTART=IBOTOM(I)
    ISTOP=ITOP(I)
    WRITE(6,1487) L,I,BC(L,I,1),L,I,BC(L,I,2)
    WRITE(6,1484) (II,A(II),II=ISTART,J)
    WRITE(6,1482)
    WRITE(6,1483) (L,I,II,K,CONC(L,I,II,K),II=ISTART,ISTOP)
    STOP
1473 DO 1474 LL=1,NOSPEC
    IF(.NOT.ISPEC(LL)) GO TO 1474
    WRITE(6,1483) (LL,I,J,II,CONC(LL,I,J,II),II=1,NOZ)
1474 CONTINUE
    IF(L.GT.4) STOP
    DO 1481 LL=1,4
1481 WRITE(6,1480) (LL,II,HOLD(LL,II),II=1,NOZ)
    STOP
*** ENTER HERE TO DUMP THE CONCENTRATION FIELD ONTO A PERIPHERAL
    STORAGE AREA
1461 IF(.NOT.PUNCH) STOP
1569 WRITE(6,1568) TOTIME,DTOLD,DT
    DO 1462 L=1,NOSPEC
    IF(.NOT.ISPEC(L)) GO TO 1462
    DO 1463 K=1,NOZ
1463 WRITE(3) ((CONC(L,I,J,K),I=1,NOX),J=1,NOY)
1462 CONTINUE
    STOP
*** FORMATS
100 FORMAT(2L1,3X,3I5,6F10.0)
101 FORMAT(2F5,1,7F10.1)
102 FORMAT(25F3,0)
103 FORMAT(6L1,6A4,6F5,2,A4)
104 FORMAT(8E10,0)
105 FORMAT(20A4)
111 FORMAT(////58X,'*RATE CONSTANTS*'&&((55X,'K(',&I2,&'')='&IPE15.7))
112 FORMAT(////61X,'*COMMENT*'&&((26X,20A4))
115 FORMAT(15,15F5,0)
117 FORMAT(16F5,0)
130 FORMAT(5A4,2F10,0)
135 FORMAT(25I3)

```

```

APS07810
APS07820
APS07830
APS07840
APS07850
APS07860
APS07870
APS07880
APS07890
APS07900
APS07910
APS07920
APS07930
APS07940
APS07950
APS07960
APS07970
APS07980
APS07990
APS08000
APS08010
APS08020
APS08030
APS08040
APS08050
APS08060
APS08070
APS08080
APS08090
APS08100
APS08110
APS08120
APS08130
APS08140
APS08150
APS08160
APS08170
APS08180
APS08190
APS08200
APS08210
APS08220
APS08230
APS08240
APS08250
APS08260
APS08270
APS08280
APS08290
APS08300
APS08310
APS08320
APS08330
APS08340
APS08350
APS08360
APS08370
APS08380
APS08390
APS08400

```

```

138 FORMAT(12F6.4)
200 FORMAT(1H1,44X,'URBAN SCALE AIR POLLUTION SIMULATION MODEL OF'//
1 26X,20A4///57X,'*INPUT PARAMETERS*'///
2 13X,'MESH SPACING IN X DIRECTION ',1PE15.7,13X,
2'MESH SPACING IN Y DIRECTION ',1PE15.7//13X,'NUMBER OF MESH POINTS
3NTS IN X-DIRECTION ',I3,15X,'NUMBER OF MESH POINTS IN Y-DIRECTION
4 ',I3//50X,'NUMBER OF VERTICAL MESH POINTS ',I2//)
1480 FORMAT(1X,5(4X,'HOLD(',I1,',',I2,')=' ,1PE10.3))
1482 FORMAT(///)
1483 FORMAT(1X,4(3X,'CONC(',I1,',',I2,',',I2,',',I2,')=' ,1PE10.3))
1484 FORMAT( 1X,6(5X,'A(',I2,')=' ,1PE10.3))
1485 FORMAT(1H1,1X,'PROGRAM TERMINATING BECAUSE A NEGATIVE ',A4,' CONCEA
INTRATION HAS BEEN PREDICTED IN INTEGRATION STEP NUMBER ',I1,' IN GAPS
2RID CELL (' ,I2,',',I2,',',I2,')'///40X,'VALUES OF SELECTED ARRAYS
3AT THE TIME OF TERMINATION'///)
1486 FORMAT(1X,'BC(',I1,',',I2,',',I2,')=' ,1PE10.3,10X,'BC(',I1,',',I2,
1',4)=' ,1PE10.3///)
1487 FORMAT(1X,'BC(',I1,',',I2,',',I2,')=' ,1PE10.3,10X,'BC(',I1,',',I2,
1',2)=' ,1PE10.3///)
1568 FORMAT(1H1,10X,'PROGRAM TERMINATING AT ',F10.3,5X,'LAST TWO TIME
1TEPS WERE ',1P2F20.3)
END

```

SUBROUTINE AVCONC

```

*** ALL TASKS RELATED TO THE CALCULATION AND OUTPUT OF TIME
AVERAGED CONCENTRATIONS ARE PERFORMED IN SUBROUTINE AVCONC

```

```

COMMON NOSPEC,NOX,NOY,NOZ,RESTR,MPASS,DT,DELTAX,DELTAY,TOTIME,ALPAP
1HA,BETA,GAMMA,EPS,ISPEC(6),NAME(6),RK(15),RKO(15),CONC(6,25,25,6)
COMMON /IOINFO/ FACTOR(6),UNIT(6),NOSTN,NOLAND,XSTN(16),YSTN(16),
1XLAND(8),YLAND(8),STNAME(16,5),LANDMK(8,5),TIMEZN
COMMON /BCOND/ ITOP(25),IBOTOM(25),ILEFT(25),IRIGHT(25),BC(6,25,4)
1 , CONCI(6,25,25)
REAL NAME,LANDMK
INTEGER STNRW
DIMENSION IVECNC(6,25,25),IHOLD(25),APRINT(32),IVESTA(6,16)
LOGICAL ISPEC
DATA BLANK/4H /

```

```

*** CALCULATE THE TIME INTERVAL OVER WHICH THE CONCENTRATIONS
HAVE BEEN TIME AVERAGED

```

```

13 DELT=TIME(T2,T1,2)
DO 1 L=1,NOSPEC
IF(.NOT.ISPEC(L)) GO TO 1
MM=DELT*100
DO 2 I=1,NOX
JSTART=IBOTOM(I)
JSTOP=ITOP(I)

```

```

*** CALCULATE THE TIME AVERAGED CONCENTRATIONS (WITH ROUND=OFF)

```

```

DO 2 J=JSTART,JSTOP
IVECNC(L,I,J)=IVECNC(L,I,J)/MM + (IVECNC(L,I,J)-(IVECNC(L,I,J)/MM
1 )*MM)*2/MM

```

100	WRITE(6,100) UNIT(1),NAME(L),T1,T2,YIMEZN,(I,I=1,NOX)	AP308960
	FORMAT(1H1,24X,'AVERAGE GROUND LEVEL CONCENTRATIONS ('A4,') OF ',	AP308970
	1 A4,' BETWEEN THE HOURS OF ',F5,0,' AND ',F5,0,1X,A4///3X,25I5//)	AP308980
C	*** CALCULATE THE ROW NUMBERS OF THE FIRST STATION AND LANDMARK	AP308990
C	MS=1	AP309000
C	ML=1	AP309010
	STNRD=YSTN(1)	AP309020
	LNDROW=YLAND(1)	AP309030
C		AP309040
C	*** BLANK OUT THE ARRAY APRINT	AP309050
C		AP309060
	DO 3 JJ=1,NOY	AP309070
	J=NOY+1-JJ	AP309080
	DO 201 I=1,32	AP309090
201	APRINT(I)=BLANK	AP309100
		AP309110
		AP309120
C	*** IF A STATION IS TO BE PRINTED IN THE PRESENT ROW, THEN	AP309130
C	PLACE THE ALPHAMERIC DESIGNATION OF THE STATION NAME IN	AP309140
C	THE APPROPRIATE LOCATIONS IN THE ARRAY APRINT	AP309150
C		AP309160
203	IF(STNRD,NE,J) GO TO 208	AP309170
	II=0	AP309180
	IJ=(XSTN(MS)-1.)*5. + 4	AP309190
	ISTART=(IJ-1)/4 - 1	AP309200
406	IF(APRINT(ISTART),EQ,BLANK) GO TO 407	AP309210
	IF(STNAME(MS,II+1),EQ,BLANK) II=II+1	AP309220
	ISTART=ISTART+1	AP309230
	GO TO 406	AP309240
407	ISTOP=ISTART + 4 - II	AP309250
	IF(ISTART,LT,1) ISTART=1	AP309260
	IF(ISTOP,GT,32) ISTOP=32	AP309270
	DO 202 I=ISTART,ISTOP	AP309280
	II=II+1	AP309290
202	APRINT(I)=STNAME(MS,II)	AP309300
C		AP309310
C	*** INCREMENT THE STATION COUNTER	AP309320
C		AP309330
	MS=MS+1	AP309340
	IF(MS,GT,NOSTN) GO TO 209	AP309350
	STNRD=YSTN(MS)	AP309360
	GO TO 203	AP309370
209	STNRD=0	AP309380
C		AP309390
C	*** IF A LANDMARK IS TO BE PRINTED IN THE PRESENT ROW, THEN	AP309400
C	PLACE THE ALPHAMERIC DESIGNATION OF THE NAME OF THE	AP309410
C	LANDMARK IN THE APPROPRIATE LOCATIONS IN THE ARRAY APRINT	AP309420
C		AP309430
208	IF(LNDROW,NE,J) GO TO 204	AP309440
	II=0	AP309450
	IJ=(XLAND(ML)-1.)*5. + 4	AP309460
	ISTART=(IJ-1)/4 - 1	AP309470
408	IF(APRINT(ISTART),EQ,BLANK) GO TO 409	AP309480
	IF(LANDMK(ML,II+1),EQ,BLANK) II=II+1	AP309490
	ISTART=ISTART+1	AP309500
	GO TO 408	AP309510
409	ISTOP=ISTART + 4 - II	AP309520
	IF(ISTART,LT,1) ISTART=1	AP309530
	IF(ISTOP,GT,32) ISTOP=32	AP309540
		AP309550

	DO 205 I=ISTART,ISTOP	AP809560
	II=I+1	AP809570
205	APRINT(I)=LANDMK(ML,II)	AP809580
C		AP809590
C	*** INCREMENT THE LANDMARK COUNTER	AP809600
C		AP809610
	ML=ML+1	AP809620
	IF(ML.GT.NOLAND) GO TO 207	AP809630
	LNDROW=YLAND(ML)	AP809640
	GO TO 208	AP809650
207	LNDROW=0	AP809660
C		AP809670
C	*** WRITE THE ARRAY APRINT	AP809680
C		AP809690
204	WRITE(6,206) APRINT	AP809700
206	FORMAT(5X,32A4)	AP809710
C		AP809720
C	*** WRITE THE TIME AVERAGED CONCENTRATIONS FOR ROW J	AP809730
	ISTART=ILEFT(J)	AP809740
	ISTOP=IRIGHT(J)	AP809750
210	DO 210 I=ISTART,ISTOP	AP809760
	IMOLD(I)=IVECNC(L,I,J)	AP809770
	CALL MAPPER(0,IMOLD,ISTART,ISTOP,APRINT)	AP809780
	WRITE(6,101) J,APRINT	AP809790
101	FORMAT(1X,I2,32A4)	AP809800
3	CONTINUE	AP809810
C		AP809820
C	*** RESET THE TIME INTEGRATED CONCENTRATION ARRAY TO ZERO	AP809830
C		AP809840
	DO 4 I=1,NOX	AP809850
	DO 4 J=1,NOY	AP809860
4	IVECNC(L,I,J)=0	AP809870
1	CONTINUE	AP809880
C		AP809890
C	*** CALCULATE THE TIME AVERAGED CONCENTRATIONS AT THE STATIONS,	AP809900
C	PRINT THE CONCENTRATIONS ON THE PROGRAM OUTPUT, AND PUNCH	AP809910
C	THE CONCENTRATIONS ONTO CARDS	AP809920
C		AP809930
	IF(NOSTN.LE.0) GO TO 350	AP809940
	DO 26 L=1,NOSPEC	AP809950
	IF(.NOT.ISPEC(L)) GO TO 26	AP809960
21	DO 21 K=1,NOSTN	AP809970
	IVESTA(L,K)=IVESTA(L,K)/MM + (IVESTA(L,K)-(IVESTA(L,K)/MM)*MM)*2/MM	AP809980
	WRITE(7,23) NAME(L),L,T1,(IVESTA(L,K),K=1,NOSTN)	AP809990
23	FORMAT(A4,I6,F6,0,(16I4))	AP810000
26	CONTINUE	AP810010
	WRITE(6,300) T1,T2,TIMEZN,NAME,UNIT	AP810020
300	FORMAT(1H1,20X,'AVERAGE GROUND LEVEL CONCENTRATIONS AT SELECTED STATIONS	AP810030
	BETWEEN THE HOURS OF ',F5,0,' AND ',F5,0,1X,A4//((65X,6(1X,A4)))	AP810040
1)		AP810050
	DO 306 L=1,NOSPEC	AP810060
	ISTART=L	AP810070
	IF(ISPEC(L)) GO TO 307	AP810080
306	CONTINUE	AP810090
307	DO 308 L=1,NOSPEC	AP810100
	ISTOP=NOSPEC+1=L	AP810110
	IF(ISPEC(ISTOP)) GO TO 309	AP810120
308	CONTINUE	AP810130
309	DO 311 K=1,NOSTN	AP810140
		AP810150

301	DO 301 L=ISTART,ISTOP	APS10160
	IMOLD(L)=IVESTA(L,K)	APS10170
	CALL MAPPER(0,IMOLD,ISTART,ISTOP,APRINT)	APS10180
311	WRITE(6,302) (STNAME(K,I),I=1,5),(APRINT(I),I=1,16)	APS10190
302	FORMAT(44X,21A4)	APS10200
C		APS10210
C	*** RESET THE TIME INTEGRATED CONCENTRATION ARRAY FOR THE	APS10220
C	STATIONS TO ZERO	APS10230
		APS10240
	DO 24 L=1,NOSPEC	APS10250
	DO 24 K=1,NOSTN	APS10260
24	IVESTA(L,K)=0	APS10270
350	T1=T2	APS10280
	RETURN	APS10290
C		APS10300
C	*** ENTRY POINT AVINIT - SET THE TIME INTEGRATED CONCENTRATION	APS10310
C	ARRAYS TO ZERO	APS10320
	ENTRY AVINIT	APS10330
	T1=TOTIME	APS10340
	DO 14 L=1,NOSPEC	APS10350
	DO 15 I=1,NOX	APS10360
	DO 15 J=1,NOY	APS10370
15	IVECNC(L,I,J)=0	APS10380
	IF(NOSTN,LE,0) GO TO 14	APS10390
	DO 25 K=1,NOSTN	APS10400
25	IVESTA(L,K)=0	APS10410
14	CONTINUE	APS10420
	RETURN	APS10430
C		APS10440
C	*** ENTRY POINT CALVC - CALCULATE THE TIME INTEGRATED CONCEN-	APS10450
C	TRATIONS	APS10460
C		APS10470
	ENTRY CALVC	APS10480
	T2=TOTIME	APS10490
C		APS10500
C	*** CALCULATE THE TIME INTEGRATED GROUND LEVEL CONCENTRATIONS	APS10510
C	USING THE TRAPEZOIDAL RULE. THE INTEGRALS ARE COMPUTED	APS10520
C	100*FACTOR(L) TIMES THEIR TRUE VALUES SO THAT INTEGER	APS10530
C	TRUNCATION IS SUPPRESSED AND ROUND-OFF MAY BE ACCOMMODATED	APS10540
C		APS10550
	DO 10 L=1,NOSPEC	APS10560
	IF(.NOT.ISPEC(L)) GO TO 10	APS10570
	FACT=MPASS*FACTOR(L)*DT*50.	APS10580
	IF(MPASS.EQ.2) FACT=FACTOR(L)*DT*50.	APS10590
	DO 11 I=1,NOX	APS10600
	JSTART=IBOTOM(I)	APS10610
	JSTOP=ITOP(I)	APS10620
	DO 11 J=JSTART,JSTOP	APS10630
	IVECNC(L,I,J)=IVECNC(L,I,J)+CONC(L,I,J,1)*FACT	APS10640
11	CONTINUE	APS10650
C		APS10660
C	*** COMPUTE THE TIME INTEGRATED CONCENTRATIONS AT THE STATIONS	APS10670
C	USING LINEAR INTERPOLATION TO PREDICT THE CONCENTRATIONS	APS10680
C	AT THE STATIONS	APS10690
		APS10700
	IF(NOSTN,1,0) GO TO 10	APS10710
	DO 20 K=1,NOSTN	APS10720
	I=XSTN(K)	APS10730
	J=YSTN(K)	APS10740
		APS10750

	IP1=I+1	APS10760
	JP1=J+1	APS10770
	IF(I,LE,0) I=1	APS10780
	IF(J,LE,0) J=1	APS10790
	IF(IP1,GT,NOX) IP1=NOX	APS10800
	IF(JP1,GT,NOY) JP1=NOY	APS10810
	X1=XSTN(K) - I	APS10820
	Y1=YSTN(K) - J	APS10830
20	IVESTA(L,K)=IVESTA(L,K)+((CONC(L,I,J,1)*(1,-X1)+CONC(L,IP1,J,1)*X1	APS10840
	1)*(1,-Y1) +(CONC(L,I,JP1,1)*(1,-X1)+CONC(L,IP1,JP1,1)*X1)*Y1)*FACT	APS10850
10	CONTINUE	APS10860
	RETURN	APS10870
	END	APS10880

SUBROUTINE BCCONC

	*** ALL OPERATIONS PERTAINING TO THE INPUT AND SPECIFICATION OF	APS10890
	BOUNDARY CONCENTRATIONS ON THE HORIZONTAL BOUNDARIES ARE	APS10900
	PERFORMED IN SUBROUTINE BCCONC	APS10910
		APS10920
		APS10930
		APS10940

	COMMON NOSPEC,NOX,NOY,NOZ,RESTRY,MPASS,DT,DELTAX,DELTAY,TOTIME,ALP	APS10950
	1HA,BETA,GAMMA,EPS,ISPEC(6),NAME(6),RK(15),RKO(15),CONC(6,25,25,6)	APS10960
	COMMON /METDTA/ HORIG(25,25),DELTAM(25,25),WINDMG(25,25),	APS10970
	1 WINDAN(25,25),WX(26,26),WY(26,26),HIGH(27,27,2)	APS10980
	COMMON /BCOND/ ITOP(25),INOTOM(25),ILEFT(25),IRIGHT(25),BC(6,25,4)	APS10990
	1 , CONCI(6,25,25)	APS11000
	COMMON /IDINFO/ FACTOR(6),UNIT(6),NOSTN,NOLAND,XSTN(16),YSTN(16),	APS11010
	1XLAND(8),YLAND(8),STNAME(16,5),LANDMK(8,5),TIMEZN	APS11020
	DATA TNEXT=-100./	APS11030
	LOGICAL ISPEC	APS11040

	*** CHECK TO SEE IF ALL BOUNDARY CONDITIONS SHOULD BE UPDATED,	APS11050
	IF NOT, UPDATE THE OZONE BOUNDARY CONCENTRATIONS ONLY,	APS11060
	IF SO, READ THE NEXT COMPLETE SET OF BOUNDARY CONCENTRATIONS,	APS11070
		APS11080
		APS11090

	IF(TOTIME,LE,TNEXT) GO TO 40	APS11100
--	------------------------------	----------

	*** INPUT CARD NO. 18	APS11110
--	-----------------------	----------

22	READ(5,20) TDATA,TNEXT	APS11120
20	FORMAT(2F10,0)	APS11130
		APS11140
		APS11150

	*** INPUT CARD NO. 19	APS11160
--	-----------------------	----------

	DO 30 L=1,NOSPEC	APS11170
	IF(.NOT.ISPEC(L)) GO TO 30	APS11180
	MSTOP=NOX	APS11190
	DO 33 J=1,4	APS11200
	IF(J,GE,3) MSTOP=NOY	APS11210
	READ(5,21) (BC(L,I ,J),I=1,MSTOP)	APS11220
21	FORMAT(25F3,0)	APS11230
		APS11240
		APS11250

	*** CONVERT THE UNITS TO PPM	APS11260
--	------------------------------	----------

	DO 32 I=1,MSTOP	APS11270
	BC(L,I ,J)=BC(L,I ,J)/FACTOR(L)	APS11280
		APS11290
		APS11300

32 CONTINUE
33 CONTINUE
30 CONTINUE

AP811310
AP811320
AP811330
AP811340
AP811350
AP811360
AP811370
AP811380
AP811390
AP811400
AP811410
AP811420
AP811430
AP811440
AP811450
AP811460
AP811470
AP811480
AP811490
AP811500
AP811510
AP811520
AP811530
AP811540
AP811550
AP811560
AP811570

*** CHECK TO SEE IF THE BOUNDARY CONCENTRATIONS ARE APPLICABLE
AT THE CURRENT SIMULATION TIME

IF(TOTIME,LT,TNEXT,AND,TOTIME,GE,TDATA) GO TO 40
GO TO 22

*** CALCULATE THE OZONE BOUNDARY CONCENTRATIONS USING THE
CHEMICAL STEADY STATE EXPRESSION

40 IF(.NOT.ISPEC(3)) RETURN
MSTOP=NOY
DO 41 J=1,4
IF(J,GE,3) MSTOP=NOY
DO 41 I=1,MSTOP
O=RK(1)*BC(4,I,J)/(RK(2)+RK(11)*BC(1,I,J))
DENOM=RK(3)*BC(2,I,J)+RK(4)*BC(4,I,J)+RK(13)*BC(1,I,J)
IF(DENOM,GT,1.0E-12) GO TO 42
BC(3,I,J)=0.
GO TO 41
42 BC(3,I,J)=RK(2)*O/DENOM
41 CONTINUE
RETURN
END

SUBROUTINE BLCKTD (N,M)

*** SUBROUTINE BLCKTD IS USED TO SOLVE A BLOCK TRIDIAGONAL
SYSTEM OF LINEAR EQUATIONS. THE OFF-DIAGONAL BLOCKS ARE
ASSUMED TO BE DIAGONAL MATRICES. THE ARRAYS A AND C
REPRESENT THE LOWER AND UPPER DIAGONAL MATRICES RESPECTIVELY.
THE ARRAY B REPRESENTS THE BLOCKS ON THE DIAGONAL, THE
ARRAYS F AND X ARE THE RIGHT HAND SIDE AND THE SOLUTION
VECTOR RESPECTIVELY.

COMMON /BLCKEQ/ A(6,4),B(6,4,4),C(6,4),F(6,4),X(6,4)
DIMENSION CC(4,4),D(4,4),Y(6,4),GAM(6,4,4)
LOGICAL KFLAG
KFLAG=.FALSE.
MM1=M-1
DO 170 K=1,N
IF(K,GT,1) GO TO 30
DO 20 I=1,M
DO 20 J=1,M
20 D(I,J)=B(1,I,J)
GO TO 60
30 DO 40 I=1,M
DO 40 J=1,M
40 D(I,J)=B(K,I,J) - A(K,I)*GAM(K-1,I,J)
DO 50 I=1,M
50 F(K,I)=F(K,I) - A(K,I)*Y(K-1,I)
60 IF(K,EQ,N) KFLAG=.TRUE.
IF(KFLAG) GO TO 221

AP811580
AP811590
AP811600
AP811610
AP811620
AP811630
AP811640
AP811650
AP811660
AP811670
AP811680
AP811690
AP811700
AP811710
AP811720
AP811730
AP811740
AP811750
AP811760
AP811770
AP811780
AP811790
AP811800
AP811810
AP811820
AP811830
AP811840
AP811850

	DO 220 I=1,M	AP311860
	DO 230 J=1,M	AP311870
230	CC(I,J)=0.	AP311880
220	CC(I,I)=C(K,I)	AP311890
221	DO 100 J=1,MM1	AP311900
	JP1=J+1	AP311910
	DO 90 I=JP1,M	AP311920
	IF(D(I,J).EQ.0.) GO TO 90	AP311930
	C1=D(I,J)/D(J,J)	AP311940
	DO 70 JJ=JP1,M	AP311950
70	D(I,JJ)=D(I,JJ) + C1*D(J,JJ)	AP311960
	IF(KFLAG) GO TO 81	AP311970
	DO 80 JJ=1,M	AP311980
80	CC(I,JJ)=CC(I,JJ) + C1*CC(J,JJ)	AP311990
81	F(K,I)=F(K,I) + C1*F(K,J)	AP312000
90	CONTINUE	AP312010
100	CONTINUE	AP312020
	IF(KFLAG) GO TO 111	AP312030
	DO 110 J=1,M	AP312040
110	GAM(K,M,J)=CC(M,J)/D(M,M)	AP312050
111	Y(K,M)=F(K,M)/D(M,M)	AP312060
	DO 160 JJ=1,MM1	AP312070
	I=M-JJ	AP312080
	IF(KFLAG) GO TO 121	AP312090
	DO 120 J=1,M	AP312100
120	GAM(K,I,J)=CC(I,J)	AP312110
121	Y(K,I)=F(K,I)	AP312120
	IP1=I+1	AP312130
	DO 140 J=IP1,M	AP312140
	IF(KFLAG) GO TO 140	AP312150
	DO 130 JJJ=1,M	AP312160
130	GAM(K,I,JJJ)=GAM(K,I,JJJ) - D(I,J)*GAM(K,J,JJJ)	AP312170
140	Y(K,I)=Y(K,I) - D(I,J)*Y(K,J)	AP312180
	IF(KFLAG) GO TO 160	AP312190
	DO 150 JJJ=1,M	AP312200
150	GAM(K,I,JJJ)=GAM(K,I,JJJ)/D(I,I)	AP312210
160	Y(K,I)=Y(K,I)/D(I,I)	AP312220
170	CONTINUE	AP312230
	DO 180 I=1,M	AP312240
180	X(N,I)=Y(N,I)	AP312250
	DO 210 KK=2,N	AP312260
	K=N+1-KK	AP312270
	DO 200 I=1,M	AP312280
	X(K,I)=Y(K,I)	AP312290
	DO 190 J=1,M	AP312300
190	X(K,I)=X(K,I) - GAM(K,I,J)*X(K+1,J)	AP312310
200	CONTINUE	AP312320
210	CONTINUE	AP312330
	RETURN	AP312340
	END	AP312350

SUBROUTINE DIFCOF(II,JJ,KZ)

*** SUBROUTINE DIFCOF RETURNS DIFFUSIVITIES (KZ) FOR THE
VERTICAL COLUMN OF GRID CELLS WITH THE COORDINATES (II,JJ)

AP312360
AP312370
AP312380
AP312390
AP312400


```

COMMON NOSPEC,NOX,NOY,NOZ,RESTRT,HPASS,DT,DELTAX,DELTAY,TOTIME,ALPAP812410
1HA,BETA,GAMMA,EPS,ISPEC(6),NAME(6),RK(15),RKO(15),CONC(6,25,25,6) AP812420
COMMON /METDTA/ HORIG(25,25),DELTAM(25,25),WINDMG(25,25), AP812430
1 WINDAN(25,25),WX(26,26),WY(26,26),HIGH(27,27,2) AP812440
REAL KZ,KZMIN,KZMAX AP812450
DIMENSION KZ(11) AP812460
KZMIN=333. AP812470
KZMAX=500.*(WINDMG(11,11)/100. + 5.) AP812480
RHO=1./FLOAT(NOZ) AP812490
NOZP1=NOZ+1 AP812500
KZ(1)=KZMIN AP812510
DO 3 K=2,NOZ AP812520
X=(K-1)*RHO AP812530
IF(X,LT,0.4) GO TO 1 AP812540
IF(X,LE,0.8) GO TO 2 AP812550
AP812560
*** COMPUTE DIFFUSIVITIES FOR 0.8 < RHO < 1.0 AP812570
KZ(K)=KZMAX - (KZMAX-KZMIN)*(X-0.8)/0.2 AP812580
GO TO 3 AP812590
AP812600
*** COMPUTE DIFFUSIVITIES FOR 0 < RHO < 0.4 AP812610
KZ(K)=KZMIN + (KZMAX-KZMIN)*X/0.4 AP812620
GO TO 3 AP812630
AP812640
*** COMPUTE DIFFUSIVITIES FOR 0.4 < RHO < 0.8 AP812650
KZ(K)=KZMAX AP812660
CONTINUE AP812670
KZ(NOZP1)=KZMIN AP812680
RETURN AP812690
END AP812700
AP812710
AP812720
AP812730

```

SUBROUTINE ICCONC

```

*** OPERATIONS RELATED TO THE INPUT AND ESTABLISHMENT OF THE
INITIAL CONCENTRATION DISTRIBUTION ARE PERFORMED IN
SUBROUTINE ICCONC

```

```

COMMON NOSPEC,NOX,NOY,NOZ,RESTRT,HPASS,DT,DELTAX,DELTAY,TOTIME,ALPAP812800
1HA,BETA,GAMMA,EPS,ISPEC(6),NAME(6),RK(15),RKO(15),CONC(6,25,25,6) AP812810
COMMON /BCOND/ ITOP(25),IBOTOM(25),ILEFT(25),IRIGHT(25),BC(6,25,4) AP812820
1 , CONCI(6,25,25) AP812830
COMMON /IDINFO/ FACTOR(6),UNIT(6),NOSTN,NOLAND,XSTN(16),YSTN(16), AP812840
1XLAND(8),YLAND(8),STNAME(16,5),LANDMK(8,5),TIMEZN AP812850
LOGICAL ISPEC,RESTRT AP812860
AP812870
*** INPUT CARD NO. 17 AP812880
DO 10 L=1,NOSPEC AP812890
IF(.NOT.ISPEC(L)) GO TO 10 AP812900
DO 12 J=1,NOY AP812910
READ(5,11) (CONCI(L,I,J),I=1,NOX) AP812920
FORMAT(25F3.0) AP812930
AP812940
AP812950

```

*** CONVERT THE UNITS TO PPM

DO 9 I=1,NOX
DO 9 J=1,NOY
CONCI(L,I,J)=CONCI(L,I,J)/FACTOR(L)
CONC(L,I,J,1)=CONCI(L,I,J)

*** SET THE CONCENTRATIONS IN CELLS ALOFT EQUAL TO THE THOSE
IN THE GROUND LEVEL CELL

DO 4 K=2,NOZ
CONC(L,I,J,K)=CONC(L,I,J,1)
CONTINUE
CONTINUE

*** CALCULATE THE INITIAL OZONE CONCENTRATIONS USING THE
CHEMICAL STEADY STATE EXPRESSION

IF(.NOT.ISPEC(3)) GO TO 30
RK(1)=RKO(1)*0.01
DO 15 I=1,NOX
JSTART=IBOTOM(I)
JSTOP=ITOP(I)
DO 15 J=JSTART,JSTOP
O=RK(1)*CONCI(4,I,J)/(RKO(2)+RKO(11)*CONCI(1,I,J))
DENOM=RKO(3)*CONCI(2,I,J)+RKO(4)*CONCI(4,I,J)+RKO(13)*CONCI(1,I,J)
IF(DENOM.GT.1.0E+12) GO TO 42
CONCI(3,I,J)=O.
GO TO 41
42 CONCI(3,I,J)=RKO(2)*O/DENOM
41 CONC(3,I,J,1)=CONCI(3,I,J)
DO 1 K=2,NOZ
1 CONC(3,I,J,K)=CONC(3,I,J,1)
15 CONTINUE

*** ENTER THIS SECTION OF CODE TO DEFINE THE INITIAL
CONCENTRATIONS WHEN A PROGRAM RESTART IS SPECIFIED

30 IF(.NOT.RESTRT) RETURN
DO 31 L=1,NOSPEC
IF(.NOT.ISPEC(L)) GO TO 31
DO 32 K=1,NOZ
32 READ(9) ((CONC(L,I,J,K),I=1,NOX),J=1,NOY)
31 CONTINUE
RETURN
END

SUBROUTINE METEOR

*** SUBROUTINE METEOR CONTROLS THE INPUT AND MANIPULATION OF THE
WIND AND MIXING DEPTH DATA WHICH IS CONTAINED ON THE METEOR-
OLOGICAL DATA FILE

COMMON NOSPEC,NOX,NOY,NOZ,RESTRY,MPASS,DT,DELTAX,DELTAY,TOTIME,ALPAP813480
1HA,BETA,GAMMA,EPS,ISPEC(6),NAME(6),RK(15),RKO(15),CONC(6,25,25,6) AP813490
COMMON /METDTA/ MORIG(25,25),DELTAM(25,25),WINDMG(25,25), AP813500

AP812960
AP812970
AP812980
AP812990
AP813000
AP813010
AP813020
AP813030
AP813040
AP813050
AP813060
AP813070
AP813080
AP813090
AP813100
AP813110
AP813120
AP813130
AP813140
AP813150
AP813160
AP813170
AP813180
AP813190
AP813200
AP813210
AP813220
AP813230
AP813240
AP813250
AP813260
AP813270
AP813280
AP813290
AP813300
AP813310
AP813320
AP813330
AP813340
AP813350
AP813360
AP813370
AP813380
AP813390
AP813400
AP813410

AP813420
AP813430
AP813440
AP813450
AP813460
AP813470
AP813480
AP813490
AP813500

```

1 WINDAN(25,25),WX(26,26),WY(26,26),HIGH(27,27,2)
  LOGICAL KFLAG1,ISPEC
  DATA KFLAG1 ,TNEXT/,FALSE, ,=100,/
  IF(KFLAG1) GO TO 10
  NOXM1=NOX-1
  NOYM1=NOY-1
  NOXP1=NOX+1
  NOYP1=NOY+1
  NOXP2=NOX+2
  NOYP2=NOY+2
  KFLAG1=.TRUE.

```

```

*** READ THE INITIAL MIXING DEPTHS

```

```

71 REWIND 4
  READ(4) ((HORIG(I,J),I=1,NOX),J=1,NOY)
  DO 9 I=1,NOX
    HIGH(I+1,1,2)=HORIG(I,1)
    HIGH(I+1,NOYP2,2)=HORIG(I,NOY)
    DO 9 J=1,NOY
      HIGH(I+1,J+1,2)=HORIG(I,J)
      DO 8 J=1,NOYP2
        HIGH(1,J,2)=HIGH(2,J,2)
        HIGH(NOX+2,J,2)=HIGH(NOX+1,J,2)
      GO TO 14
    IF(TOTIME,GE,THIGH) GO TO 11
    IF(TOTIME,LT,TDATA) GO TO 71
    DO 19 I=1,NOXP2
      DO 19 J=1,NOYP2
        HIGH(I,J,2)=HIGH(I,J,1)
      GO TO 80
    THIGHO=THIGH

```

```

*** SET THE 'OLD' VALUES OF THE MIXING DEPTHS EQUAL TO THE
    PREVIOUS 'NEW' VALUES OF THE MIXING DEPTHS

```

```

DO 15 I=1,NOXP2
DO 15 J=1,NOYP2
15 HIGH(I,J,1)=HIGH(I,J,2)
  IF(THIGHO,EQ,TNEXT) GO TO 14
  IF(TOTIME,LE,TNEXT) GO TO 80
  DELT=TIME(TNEXT,THIGHO,2)
  DT=DELT
  TOTIME=TNEXT
  GO TO 12

```

```

*** READ THE TIME INTERVAL, WIND SPEEDS, WIND DIRECTIONS, AND
    THE TIME RATE OF CHANGE OF THE MIXING DEPTHS

```

```

14 READ(4,END=100) TDATA, TNEXT
  READ(4) ((WINDMS(I,J),I=1,NOX),J=1,NOY)
  READ(4) ((WINDAN(I,J),I=1,NOX),J=1,NOY)
  READ(4) ((DELTAN(I,J),I=1,NOX),J=1,NOY)

```

```

*** CHECK APPLICABILITY OF THE CURRENT METEOROLOGICAL DATA

```

```

  IF(TDATA,GT,TOTIME) GO TO 100
  IF(TOTIME,LE,TNEXT) GO TO 60

```

```

*** THIS SECTION OF CODE IS ENTERED WHEN THE METEOROLOGICAL DATA

```

APS13510
 APS13520
 APS13530
 APS13540
 APS13550
 APS13560
 APS13570
 APS13580
 APS13590
 APS13600
 APS13610
 APS13620
 APS13630
 APS13640
 APS13650
 APS13660
 APS13670
 APS13680
 APS13690
 APS13700
 APS13710
 APS13720
 APS13730
 APS13740
 APS13750
 APS13760
 APS13770
 APS13780
 APS13790
 APS13800
 APS13810
 APS13820
 APS13830
 APS13840
 APS13850
 APS13860
 APS13870
 APS13880
 APS13890
 APS13900
 APS13910
 APS13920
 APS13930
 APS13940
 APS13950
 APS13960
 APS13970
 APS13980
 APS13990
 APS14000
 APS14010
 APS14020
 APS14030
 APS14040
 APS14050
 APS14060
 APS14070
 APS14080
 APS14090
 APS14100

IS NOT APPLICABLE, THE 'NEW' VALUES OF THE MIXING DEPTH ARE
CALCULATED TO BE APPLICABLE AT THE CURRENT VALUE OF TNEXT,
THEN THE NEXT SET OF METEOROLOGICAL DATA IS OBTAINED FROM
THE FILE.

DELT=TIME(TNEXT,TDATA,2)

DO 13 I=1,NOX

DO 13 J=1,NOY

HIGH(I+1,J+1,2)=HIGH(I+1,J+1,2) + DELT*DELTAN(I,J)

GO TO 14

*** CALCULATE THE X AND Y COMPONENTS OF THE WIND SPEED

DO 20 I=1,NOX

WY(I,1)=WINDMG(I,1)*COS(WINDAN(I,1))

WY(I,NOYP1)=WINDMG(I,NOY)*COS(WINDAN(I,NOY))

DO 28 J=1,NOYM1

WY(1,J+1)=0.5*(WINDMG(1,J)*COS(WINDAN(1,J))+WINDMG(1,J+1)*
1 COS(WINDAN(1,J+1)))

DO 27 I=1,NOXM1

WX(I+1,1)=0.5*(WINDMG(I,1)*SIN(WINDAN(I,1))+WINDMG(I+1,1)*
1 SIN(WINDAN(I+1,1)))

DO 21 J=1,NOY

WX(1,J)=WINDMG(1,J)*SIN(WINDAN(1,J))

21 WX(NOXP1,J)=WINDMG(NOX,J)*SIN(WINDAN(NOX,J))

DO 22 I=2,NOX

DO 22 J=2,NOY

WX(I,J)=0.5*(WINDMG(I-1,J)*SIN(WINDAN(I-1,J))+WINDMG(I,J)*SIN(WINDAN(I,J)))

22 WY(I,J)=0.5*(WINDMG(I,J-1)*COS(WINDAN(I,J-1))+WINDMG(I,J)*COS(WINDAN(I,J)))

*** CALCULATE THE SPATIAL DISTRIBUTION OF POINT SOURCE EMISSIONS

CALL PTSOUR

DELT=TIME(TOTIME,TDATA,2)

GO TO 12

DELT=DT

*** CALCULATE 'NEW' VALUES OF THE MIXING DEPTHS

DO 16 I=1,NOX

DO 16 J=1,NOY

16 HIGH(I+1,J+1,2)=HIGH(I+1,J+1,2) + DELT*DELTAN(I,J)

DO 17 I=1,NOX

HIGH(I+1,1,2)=HIGH(I+1,2,2)

17 HIGH(I+1,NOYP2,2)=HIGH(I+1,NOYP1,2)

DO 18 J=1,NOYP2

HIGH(1,J,2)=HIGH(2,J,2)

18 HIGH(NOXP2,J,2)=HIGH(NOXP1,J,2)

THIGH=TOTIME

RETURN

*** THIS SECTION OF CODE IS ENTERED IF NO METEOROLOGICAL DATA
EXISTS ON THE METEOROLOGICAL DATA FILE APPLICABLE AT TIME
TOTIME

100 WRITE(6,101) TOTIME

101 FORMAT(///15X,'PROGRAM TERMINATING IN SUBROUTINE METEOR DUE TO THE
1 LACK OF METEOROLOGICAL DATA APPLICABLE AT ',F7.2)

STOP
END

AP814710
AP814720

SUBROUTINE PRINT1

*** ALL TASKS RELATED TO THE OUTPUT OF 'INSTANTANEOUS' GROUND
LEVEL CONCENTRATION MAPS AND VERTICAL CONCENTRATION PROFILES
ABOVE EACH STATION ARE CARRIED OUT IN SUBROUTINE PRINT1

COMMON NOSPEC,NOX,NOY,NOZ,RESTR,MPASS,DT,DELTAX,DELTAY,TOTIME,ALP
1 HA,BETA,GAMMA,EP8,ISPEC(6),NAME(6),RK(15),RKO(15),CONC(6,25,25,6)
COMMON /METDTA/ HORIG(25,25),DELTAM(25,25),WINDMG(25,25),
1 WINDAN(25,25),WX(26,26),WY(26,26),HIGH(27,27,2)
COMMON /IOINFO/ FACTOR(6),UNIT(6),NOSTN,NOLAND,XSTN(16),YSTN(16),
1 XLAND(8),YLAND(8),STNAME(16,5),LANDMK(8,5),TIMEZN
COMMON /BCOND/ ITOP(25),IBOTOM(25),ILEFT(25),IRIGHT(25),BC(6,25,4)
1 , CONCI(6,25,25)
LOGICAL ISPEC
INTEGER STNROW,IMOLD(25)
REAL NAME,LANDMK,APRINT(32),A(10)
DATA BLANK/4H /

*** CALCULATE AND PRINT THE VERTICAL CONCENTRATION PROFILE
ABOVE EACH STATION FOR EACH SPECIES

IF(NOSTN,LE,0) GO TO 300
WRITE(6,399) TOTIME,TIMEZN
399 FORMAT(1H1,33X,'VERTICAL CONCENTRATION PROFILES ABOVE SELECTED SIT
1ES AT ',F7.2,1X,A4)
DO 301 M=1,NOSTN
I=XSTN(M)
J=YSTN(M)
IP1=I+1
JP1=J+1
IF(I,LE,0) I=1
IF(J,LE,0) J=1
IF(IP1,GT,NOX) IP1=NOX
IF(JP1,GT,NOY) JP1=NOY
X1=XSTN(M) = I
Y1=YSTN(M) = J
WRITE(6,398) (STNAME(M,L),L=1,5),HIGH(I+1,J+1,2)
398 FORMAT(///40X,5A4,5X,'MIXING DEPTH ',F7.1,' FEET')

*** USE LINEAR INTERPOLATION TO CALCULATE THE CONCENTRATIONS

DO 302 L=1,NOSPEC
IF(.NOT.ISPEC(L)) GO TO 302
DO 303 K=1,NOZ
303 A(K)=((CONC(L,I,J,K)*(1.-X1)+CONC(L,IP1,J,K)*X1)*(1.-Y1)+(CONC(L,I,JP1,K)*(1.-X1)+CONC(L,IP1,JP1,K)*X1)*Y1)*FACTOR(L)
1 L,I,JP1,K)*(1.-X1)+CONC(L,IP1,JP1,K)*X1)*Y1)*FACTOR(L)
WRITE(6,397) NAME(L),UNIT(L),(A(K),K=1,NOZ)
397 FORMAT(25X,A4,'(',A4,')',10F12,2)
302 CONTINUE
301 CONTINUE

*** PRINT THE GROUND LEVEL CONCENTRATION MAP FOR EACH SPECIES

500	DO 10 L=1,NOSPEC	AP815260
	IF(,NOT,ISPEC(L)) GO TO 10	AP815270
	WRITE(6,105) NAME(L),UNIT(L),TOTIME,TIMEZN,(I,I=1,NOX)	AP815280
105	FORMAT(1H1,39X,A4,' GROUND LEVEL CONCENTRATIONS (' ,A4,') AT ',F7,2AP815290	AP815300
	1,1X,A4 ///3X,25I5//)	AP815310
	MS=1	AP815320
	ML=1	AP815330
	STNR0W=YSTN(1)	AP815340
	LNDROW=YLAND(1)	AP815350
	DO 3 JJ=1,NOY	AP815360
	J=NOY+1-JJ	AP815370
C		AP815380
C	*** BLANK THE ARRAY APRINT	AP815390
C		AP815400
	DO 201 I=1,32	AP815410
201	APRINT(I)=BLANK	AP815420
C		AP815430
C	*** IF A STATION NAME IS TO BE PRINTED IN ROW J, THEN PLACE	AP815440
C	THE ALPHAMERIC DESIGNATION OF THE STATION NAME IN THE	AP815450
C	APPROPRIATE LOCATIONS IN THE ARRAY APRINT	AP815460
		AP815470
203	IF(STNR0W,NE,J) GO TO 208	AP815480
	II=0	AP815490
	IJ=(XSTN(MS)-1,)*5, + 4	AP815500
	ISTART=(IJ-1)/4 - 1	AP815510
406	IF(APRINT(ISTART),EQ,BLANK) GO TO 407	AP815520
	IF(STNAME(MS,II+1),EQ,BLANK) II=II+1	AP815530
	ISTART=ISTART+1	AP815540
	GO TO 406	AP815550
407	ISTOP=ISTART + 4 - II	AP815560
	IF(ISTART,LT,1) ISTART=1	AP815570
	IF(ISTOP,GT,32) ISTOP=32	AP815580
	DO 202 I=ISTART,ISTOP	AP815590
	II=II+1	AP815600
202	APRINT(I)=STNAME(MS,II)	AP815610
	MS=MS+1	AP815620
	IF(MS,GT,NOSTN) GO TO 209	AP815630
	STNR0W=YSTN(MS)	AP815640
	GO TO 203	AP815650
209	STNR0W=0	AP815660
C		AP815670
C	*** IF A LANDMARK NAME IS TO BE PRINTED IN ROW J, THEN PLACE	AP815680
C	THE ALPHAMERIC DESIGNATION OF THE NAME IN THE APPROPRIATE	AP815690
C	LOCATIONS IN THE ARRAY APRINT	AP815700
		AP815710
208	IF(LNDROW,NE,J) GO TO 204	AP815720
	II=0	AP815730
	IJ=(XLAND(ML)-1,)*5, + 4	AP815740
	ISTART=(IJ-1)/4 - 1	AP815750
408	IF(APRINT(ISTART),EQ,BLANK) GO TO 409	AP815760
	IF(LANDMK(ML,II+1),EQ,BLANK) II=II+1	AP815770
	ISTART=ISTART+1	AP815780
	GO TO 408	AP815790
409	ISTOP=ISTART + 4 - II	AP815800
	IF(ISTART,LT,1) ISTART=1	AP815810
	IF(ISTOP,GT,32) ISTOP=32	AP815820
	DO 205 I=ISTART,ISTOP	AP815830
	II=II+1	AP815840
205	APRINT(I)=LANDMK(ML,II)	AP815850

	ML=ML+1	APS15860
	IF (ML.GT.NDLAND) GO TO 207	APS15870
	LNDROW=MYLAND(ML)	APS15880
	GO TO 208	APS15890
207	LNDROW=0	APS15900
C		APS15910
C	*** WRITE THE ARRAY APRINT ON THE PROGRAM OUTPUT	APS15920
C		APS15930
204	WRITE(6,206) APRINT	APS15940
206	FORMAT(5X,32A4)	APS15950
C		APS15960
C	*** WRITE THE CONCENTRATIONS IN ROW J ON THE PROGRAM OUTPUT	APS15970
C		APS15980
	ISTART=ILEFT(J)	APS15990
	ISTOP=IRIGHT(J)	APS16000
	DO 210 I=ISTART,ISTOP	APS16010
210	IHOLD(I)=(CONC(L,I,J,1)*FACTOR(L)+0.05)*10.	APS16020
	CALL MAPPER(1,IHOLD,ISTART,ISTOP,APRINT)	APS16030
	WRITE(6,101) J,APRINT	APS16040
101	FORMAT(1X,I2,1X,32A4)	APS16050
3	CONTINUE	APS16060
10	CONTINUE	APS16070
	RETURN	APS16080
	END	APS16090
	SUBROUTINE PTSOUR	APS16100
C		APS16110
C	*** SUBROUTINE PTSOUR DISTRIBUTES THE EMISSIONS FROM POINT	APS16120
C	SOURCES AMONG THOSE VERTICAL COLUMNS OF GRID CELLS DOWNWIND	APS16130
C	OF THE SOURCES	APS16140
C		APS16150
	COMMON NOSPEC,NOX,NOY,NOZ,RESTRT,MPASS,DT,DELTAX,DELTAY,TOTIME,ALP	APS16160
	IHA,BETA,GAMMA,EP8,ISPEC(6),NAME(6),RK(15),RKO(15),CONC(6,25,25,6)	APS16170
	COMMON /METDTA/ HORTG(25,25),DELTAM(25,25),WINDMG(25,25),	APS16180
	1 WINDAN(25,25),WX(26,26),WY(26,26),HIGH(27,27,2)	APS16190
	COMMON /SOUR/ NOPTS,MAXPTS,XPTS(15),YPTS(15),HEMIS(15),IJPTS(45),	APS16200
	1 PTEMIS(6,15),TEMPTS(15,24),OPTS(6,45),QOLD(6,25,25),QNEW(6,25,25)	APS16210
	COMMON /BCOND/ ITOP(25),IBOTOM(25),ILEFT(25),IRIGHT(25),BC(6,25,4)	APS16220
	1 , CONCI(6,25,25)	APS16230
	DIMENSION X(4),Y(4)	APS16240
	LOGICAL KFLAG,ISPEC	APS16250
	DATA DELT,KFLAG/60,.,.FALSE, /	APS16260
	IF(NOPTS,LE,0) RETURN	APS16270
	IF(KFLAG) GO TO 50	APS16280
C		APS16290
C	*** CONVERT TEMPORAL DISTRIBUTIONS FROM AN HOURLY BASIS TO A	APS16300
C	MINUTE BASIS, AND CONVERT THE EMISSIONS RATE TO A FLUX BASED	APS16310
C	ON THE AREA DELTAX*DELTAY	APS16320
C		APS16330
	DO 53 I=1,NOPTS	APS16340
	DO 52 J=1,24	APS16350
52	TEMPTS(I,J)=TEMPTS(I,J)/60.	APS16360
	DO 51 L=1,NOSPEC	APS16370
51	PTEMIS(L,I)=PTEMIS(L,I)*3.943E8/(DELTAX*DELTAY)	APS16380
53	CONTINUE	APS16390
	KFLAG=.TRUE,	APS16400

50	MAXPTS=0	APS16410
	LHOUR=TOTIME/100. + 1	APS16420
	DO 1 K=1,NOPTS	APS16430
	NOSEG=1	APS16440
C		APS16450
C	*** COMPUTE THE COORDINATES OF THE POINT SOURCE LOCATION	APS16460
C		APS16470
	X(1)=XPTS(K)+ 0.5	APS16480
	Y(1)=YPTS(K) + 0.5	APS16490
	I=X(1)	APS16500
	J=Y(1)	APS16510
C		APS16520
C	*** IF POLLUTANTS ARE EMITTED ABOVE THE INVERSION, THEN DO NOT	APS16530
C	CONSIDER THE EMISSIONS FROM THE SOURCE	APS16540
C		APS16550
	IF(HIGH(I+1,J+1,2),LT,HEMIS(K)) GO TO 1	APS16560
C		APS16570
C	*** COMPUTE THE COORDINATES OF THE END POINT OF THE EMISSIONS	APS16580
C	DISTRIBUTION LINE AND THE COORDINATES OF THE POINTS AT WHICH	APS16590
C	THE EMISSIONS DISTRIBUTION LINE INTERSECTS GRID CELL	APS16600
C	BOUNDARIES	APS16610
	DX=DELTA*WINDMG(I,J)*SIN(WINDAN(I,J))/DELTAX	APS16620
	DY=DELTA*WINDMG(I,J)*COS(WINDAN(I,J))/DELTAY	APS16630
	X(4)=X(1) + DX	APS16640
	IF(ABS(I-INT(X(4))) .LE.1) GO TO 100	APS16650
	II=1	APS16660
	IF(X(4).GT,X(1)) II=2	APS16670
	X(4)=I+II	APS16680
	FACT=ABS((X(4)-X(1))/DX)	APS16690
	DY=DY*FACT	APS16700
	DX=DX*FACT	APS16710
100	Y(4)=Y(1) + DY	APS16720
	IF(ABS(J-INT(Y(4))) .LE.1) GO TO 200	APS16730
	II=1	APS16740
	IF(Y(4).GT,Y(1)) II=2	APS16750
	Y(4)=J+II	APS16760
	X(4)=X(1) + DX*ABS((Y(4)-Y(1))/DY)	APS16770
200	CONTINUE	APS16780
	IF(J.EQ,INT(Y(4))) GO TO 20	APS16790
	NOSEG=2	APS16800
	Y(2)=INT(Y(1))	APS16810
	IF(Y(4).GT,Y(1)) Y(2)=Y(2)+1,	APS16820
	X(2)=(Y(2)-Y(1))*(X(4)-X(1))/(Y(4)-Y(1)) + X(1)	APS16830
20	IF(I.EQ,INT(X(4))) GO TO 10	APS16840
	NOSEG=NOSEG+1	APS16850
	X(NOSEG)=INT(X(1))	APS16860
	IF(X(4).GT,X(1)) X(NOSEG)=X(NOSEG) + 1,	APS16870
	Y(NOSEG)=(X(NOSEG)-X(1))*(Y(4)-Y(1))/(X(4)-X(1)) + Y(1)	APS16880
10	TLNGTH=SQRT((X(1)-X(4))**2+(Y(1)-Y(4))**2)	APS16890
	IF(NOSEG.GT,2) GO TO 30	APS16900
	X(NOSEG+1)=X(4)	APS16910
	Y(NOSEG+1)=Y(4)	APS16920
	GO TO 31	APS16930
30	IF(ABS(X(1)-X(2)).GT,ABS(X(1)-X(3))) GO TO 32	APS16940
	IF(ABS(Y(1)-Y(2)).LT,ABS(Y(1)-Y(3))) GO TO 31	APS16950
32	TEMP=X(2)	APS16960
	X(2)=X(3)	APS16970
	X(3)=TEMP	APS16980
	TEMP=Y(2)	APS16990
		APS17000

	Y(2)=Y(3)	APS17010
	Y(3)=TEMP	APS17020
31	DO 33 L=1,NOSEG	APS17030
	II=(X(L)+X(L+1))/2.	APS17040
	JJ=(Y(L)+Y(L+1))/2.	APS17050
	IF(JJ,LT,1,OR,JJ,GT,NOY) GO TO 33	APS17060
	IF(II,LT,ILEFT(JJ),OR,II,GT,IRIGHT(JJ)) GO TO 33	APS17070
	R=SQRT((X(L)-X(L+1))**2+(Y(L)-Y(L+1))**2)	APS17080
	MAXPTS=MAXPTS+1	APS17090
	IJPTS(MAXPTS)=100*II + JJ	APS17100
C		APS17110
C	*** APPORTION THE EMISSIONS AMONG THE GRID CELLS ACCORDING TO	APS17120
C	THE LENGTH OF THE EMISSIONS DISTRIBUTION LINE OCCUPYING THE	APS17130
C	CELL	APS17140
	DO 34 LL=1,NOSPEC	APS17150
	IF(.NOT.ISPEC(LL)) GO TO 34	APS17160
	IF(TLNGTH,LT,1.0E-20) GO TO 38	APS17170
	QPTS(LL,MAXPTS)=PTHEIS(LL,K)*TEMPTS(K,LHOUR)*R/TLNGTH	APS17180
	GO TO 34	APS17190
38	QPTS(LL,MAXPTS)=PTHEIS(LL,K)*TEMPTS(K,LHOUR)	APS17200
34	CONTINUE	APS17210
33	CONTINUE	APS17220
1	CONTINUE	APS17230
C		APS17240
C	*** SORT THE ARRAYS IJPTS AND QPTS IN SUCH A MANNER THAT	APS17250
C	IJPTS(1) < IJPTS(2) < ... < IJPTS(MAXPTS)	APS17260
C		APS17270
	M=MAXPTS+1	APS17280
	DO 40 I=1,M	APS17290
	JSTART=I+1	APS17300
	DO 41 J=JSTART,MAXPTS	APS17310
	IF(IJPTS(I).LE,IJPTS(J)) GO TO 41	APS17320
	DO 43 L=1,NOSPEC	APS17330
	IF(.NOT.ISPEC(L)) GO TO 43	APS17340
	TEMP=QPTS(L,I)	APS17350
	QPTS(L,I)=QPTS(L,J)	APS17360
	QPTS(L,J)=TEMP	APS17370
43	CONTINUE	APS17380
	II=IJPTS(I)	APS17390
	IJPTS(I)=IJPTS(J)	APS17400
	IJPTS(J)=II	APS17410
41	CONTINUE	APS17420
40	CONTINUE	APS17430
	II=0	APS17440
560	II=II+1	APS17450
	IF(II,GE,MAXPTS) RETURN	APS17460
	IF(IJPTS(II),NE,IJPTS(II+1)) GO TO 560	APS17470
	JSTART=II+2	APS17480
	DO 46 L=1,NOSPEC	APS17490
	IF(.NOT.ISPEC(L)) GO TO 46	APS17500
	QPTS(L,II)=QPTS(L,II) + QPTS(L,II+1)	APS17510
	IF(JSTART,GT,MAXPTS) GO TO 46	APS17520
	DO 556 J=JSTART,MAXPTS	APS17530
556	QPTS(L,J+1)=QPTS(L,J)	APS17540
46	CONTINUE	APS17550
	IF(JSTART,GT,MAXPTS) GO TO 558	APS17560
	DO 557 J=JSTART,MAXPTS	APS17570
557	IJPTS(J+1)=IJPTS(J)	APS17580
558	MAXPTS=MAXPTS + 1	APS17590
		APS17600

GO TO 560
END

APS17610
APS17620

SUBROUTINE SIMDIG(N)

*** SUBROUTINE SIMDIG IS USED TO SOLVE A TRIDIAGONAL SYSTEM OF
N LINEAR EQUATIONS. THE SUBDIAGONAL, DIAGONAL, AND UPPER
DIAGONAL ELEMENTS ARE CONTAINED IN THE ARRAYS A, B, AND C
RESPECTIVELY. THE RIGHT HAND SIDE AND SOLUTION VECTOR
ARE CONTAINED IN ARRAYS Y AND X RESPECTIVELY.

COMMON /LINEQN/ A(30),B(10),C(10),X(10),Y(10)
DIMENSION Z(10),AOMEGA(10)
NMIN1 = N - 1
Z(1) = Y(1)/B(1)
AOMEGA(1) = B(1)
DO 1 I=2,NMIN1
AOMEGA(I) = B(I) - A(I)*C(I-1)/AOMEGA(I-1)
Z(I) = (Y(I) - A(I)*Z(I-1))/AOMEGA(I)
AOMEGA(N) = B(N) - A(N)*C(NMIN1)/AOMEGA(NMIN1)
X(N) = (Y(N) - A(N)*Z(NMIN1))/AOMEGA(N)
DO 2 I=1,NMIN1
M = N - I
X(M) = Z(M) - C(M)*X(M+1)/AOMEGA(M)
RETURN
END

APS17630
APS17640
APS17650
APS17660
APS17670
APS17680
APS17690
APS17700
APS17710
APS17720
APS17730
APS17740
APS17750
APS17760
APS17770
APS17780
APS17790
APS17800
APS17810
APS17820
APS17830
APS17840
APS17850

SUBROUTINE SOURCE

*** ALL OPERATIONS RELATED TO THE INPUT AND MANIPULATION OF
THE GROUND LEVEL EMISSION FLUXES ARE PERFORMED IN SUBROUTINE
SOURCE

COMMON NOSPEC,NOX,NOY,NOZ,RESTR,MPASS,DT,DELTAX,DELTAY,TOTIME,ALP
1HA,BETA,GAMMA,EPS,ISPEC(6),NAME(6),RK(15),RKO(15),CONC(6,25,25,6)
COMMON /SOUR/ NOPTS,MAXPTS,XPTS(15),YPTS(15),HEMIS(15),IJPTS(45),
1 PTEMIS(6,15),TEMPTS(15,24),QPTS(6,45),QOLD(6,25,25),QNEW(6,25,25)
COMMON /BCOND/ ITOP(25),IBOTOM(25),ILEFT(25),IRIGHT(25),BC(6,25,4)
1 , CONCI(6,25,25)
LOGICAL ISPEC,KFLAG
DATA KFLAG,TNEXT/,FALSE,,-100,/
DIMENSION QSLOPE(6,25,25)
IF(KFLAG) GO TO 10
KFLAG=,TRUE.

APS17860
APS17870
APS17880
APS17890
APS17900
APS17910
APS17920
APS17930
APS17940
APS17950
APS17960
APS17970
APS17980
APS17990
APS18000
APS18010
APS18020
APS18030
APS18040
APS18050
APS18060
APS18070
APS18080
APS18090
APS18100

*** READ THE INITIAL VALUES OF THE EMISSION FLUXES

REWIND 2
DO 1 L=1,NOSPEC
1 READ(2) ((QNEW(L,I,J),I=1,NOX),J=1,NOY)
GO TO 51
10 IF(TOTIME,GE,TQNEW) GO TO 13

	IF(TOTIME.LT.TDATA) GO TO 53	APS18110
	DO 15 L=1,NOSPEC	APS18120
	IF(.NOT.ISPEC(L)) GO TO 15	APS18130
	DO 14 I=1,NOX	APS18140
	JSTART=IBOTOM(I)	APS18150
	JSTOP=ITOP(I)	APS18160
	DO 14 J=JSTART,JSTOP	APS18170
14	QNEW(L,I,J)=QOLD(L,I,J)	APS18180
15	CONTINUE	APS18190
	GO TO 80	APS18200
C		APS18210
C	*** SET THE 'OLD' VALUES OF THE EMISSION FLUXES EQUAL TO THE	APS18220
C	PREVIOUS 'NEW' VALUES OF THE EMISSION FLUXES	APS18230
C		APS18240
13	DO 17 L=1,NOSPEC	APS18250
	IF(.NOT.ISPEC(L)) GO TO 17	APS18260
	DO 16 I=1,NOX	APS18270
	JSTART=IBOTOM(I)	APS18280
	JSTOP=ITOP(I)	APS18290
	DO 16 J=JSTART,JSTOP	APS18300
16	QOLD(L,I,J)=QNEW(L,I,J)	APS18310
17	CONTINUE	APS18320
	TQOLD=TQNEW	APS18330
	IF(TOTIME.LE.TNEXT) GO TO 80	APS18340
	DELT=TIME(TNEXT,TQOLD,2)	APS18350
	GO TO 50	APS18360
C		APS18370
C	*** READ THE TIME INTERVAL AND TIME RATE OF CHANGE OF THE	APS18380
C	MIXING DEPTHS FROM THE EMISSIONS DATA FILE	APS18390
C		APS18400
51	READ(2,END=100) TDATA,TNEXT	APS18410
	DO 2 L=1,NOSPEC	APS18420
2	READ(2) ((QSLOPE(L,I,J),I=1,NOX),J=1,NOY)	APS18430
C		APS18440
C	*** CHECK THE APPLICABILITY OF THE CURRENT VALUES OF QSLOPE	APS18450
C		APS18460
	IF(TOTIME.LT.TDATA) GO TO 100	APS18470
	IF(TOTIME.LE.TNEXT) GO TO 60	APS18480
52	DELT=TIME(TNEXT,TDATA,2)	APS18490
C		APS18500
C	*** THE CURRENT VALUES OF QSLOPE ARE NOT APPLICABLE AT TIME	APS18510
C	TOTIME. COMPUTE THE 'NEW' VALUES OF THE FLUXES APPLICABLE	APS18520
C	AT TIME TNEXT AND THEN READ THE NEXT BLOCK OF EMISSIONS DATA	APS18530
C		APS18540
50	DO 11 L=1,NOSPEC	APS18550
	IF(.NOT.ISPEC(L)) GO TO 11	APS18560
	DO 12 I=1,NOX	APS18570
	JSTART=IBOTOM(I)	APS18580
	JSTOP=ITOP(I)	APS18590
	DO 12 J=JSTART,JSTOP	APS18600
12	QNEW(L,I,J)=QNEW(L,I,J) + DELT*QSLOPE(L,I,J)	APS18610
11	CONTINUE	APS18620
	GO TO 51	APS18630
60	DELT=TIME(TOTIME,TDATA,2)	APS18640
	GO TO 83	APS18650
80	DELT=DT	APS18660
C		APS18670
C	*** CALCULATE VALUES OF THE FLUXES APPLICABLE AT TIME TOTIME	APS18680
		APS18690
83	DO 82 L=1,NOSPEC	APS18700

	IF(,NOT,ISPEC(L)) GO TO 82	AP818710
	DO 81 I=1,NOX	AP818720
	JSTART=IBOTUM(I)	AP818730
	JSTOP=ITOP(I)	AP818740
	DO 81 J=JSTART,JSTOP	AP818750
81	ONEW(L,I,J)=ONEW(L,I,J) + DELT*QSLOPE(L,I,J)	AP818760
82	CONTINUE	AP818770
	TONEW=TOTIME	AP818780
	RETURN	AP818790
C		AP818800
C	*** THE NEXT SECTION OF CODE IS ENTERED WHEN NO EMISSIONS DATA	AP818810
C	EXISTS ON THE EMISSIONS DATA FILE APPLICABLE AT TIME TOTIME	AP818820
C		AP818830
100	WRITE(6,101) TOTIME	AP818840
101	FORMAT(///20X , 'PROGRAM TERMINATING IN SUBROUTINE SOURCE DUE TO	AP818850
	THE LACK OF SOURCE DATA APPLICABLE AT ',F7,2)	AP818860
	STOP	AP818870
	END	AP818880
	REAL FUNCTION TIME(T1,T2,M)	AP818890
C		AP818900
C	*** REAL FUNCTION TIME IS USED TO PERFORM ARITHMETIC OPERATIONS	AP818910
C	INVOLVING TIMES IN MINUTES AND TIMES BASED ON A 2400 HOUR	AP818920
C	CLOCK	AP818930
C		AP818940
	GO TO (1,2,3),M	AP818950
C		AP818960
C	*** ADD A TIME IN MINUTES TO A 2400 HOUR TIME AND RETURN A 2400	AP818970
C	HOUR TIME	AP818980
C		AP818990
1	I100=T1/100	AP819000
	T3=T1 -100.0*I100 + T2	AP819010
	I100=I100 + INT(T3/60)	AP819020
	TIME=I100*100.0 + T3 - 60.0*INT(T3/60)	AP819030
	RETURN	AP819040
C		AP819050
C	*** SUBTRACT TWO 2400 HOUR TIMES AND RETURN THE RESULT IN MINUTES	AP819060
2		AP819070
	I100=T1/100	AP819080
	TIME=T1 - I100*40.0	AP819090
	I100=T2/100	AP819100
	TIME=TIME - T2 + I100*40.0	AP819110
	RETURN	AP819120
C		AP819130
C	*** SUBTRACT A TIME IN MINUTES FROM A 2400 HOUR TIME AND RETURN	AP819140
C	A 2400 HOUR TIME	AP819150
3		AP819160
	IF(T1-T2=INT(T1/100.)*100.0,LT,0.0) GO TO 4	AP819170
	TIME=T1-T2	AP819180
	RETURN	AP819190
4		AP819200
	T3=T1 - INT(T1/100.)*100.	AP819210
	TIME=INT(T1/100.)*100. - 40. + T3-T2	AP819220
	RETURN	AP819230
	END	

HAPPER	CSECT		AP819240
*			AP819250
*	CALLING SEQUENCE:		AP819260
*			AP819270
*	CALL HAPPER(IFLAG,IARRAY,ILOW,IMHIGH,IALPHA)		AP819280
*			AP819290
*	WHERE		AP819300
*	FLAG=0 => FIXED POINT FORMATTED OUTPUT		AP819310
*	>0 => FLOATING-POINT FORMATTED OUTPUT		AP819320
*	IARRAY IS A 25-ENTRY INTEGER*4 ARRAY OF INPUT		AP819330
*	ILOW IS AN INTEGER*4 VARIABLE DEFINING THE LOW INDEX		AP819340
*	INTO THE INPUT ARRAY		AP819350
*	IMHIGH IS AN INTEGER*4 VARIABLE DEFINING THE HIGH INDEX		AP819360
*	INTO THE INPUT ARRAY		AP819370
*	IALPHA IS A 32-ENTRY INTEGER*4 ARRAY, WHICH IS FILLED		AP819380
*	WITH ALPHABETIC CHARACTERS BY THE		AP819390
*	SUBROUTINE. THIS IS IN A FORM SUIT-		AP819400
*	ABLE FOR PRINTING BY A		AP819410
*	31A4,A1 FORMAT.		AP819420
*			AP819430
NUMBER	EQU 2		AP819440
TEMP3	EQU 3		AP819450
TEMP4	EQU 4		AP819460
TEMP5	EQU 5		AP819470
INPUT	EQU 5		AP819480
ALPHA	EQU 6		AP819490
INDEX2	EQU 7		AP819500
INDEX1	EQU 8		AP819510
INC	EQU 10		AP819520
R15	EQU 15		AP819530
SPACE	3		AP819540
USING	*,R15	DEFINE A TEMPORARY BASE REGISTER	AP819550
STM	14,12,12(13)	SAVE THE CALLER'S REGISTERS	AP819560
L	12,=A(HAPPER)	GET THE ADDRESS OF THE CSECT AND	AP819570
USING	HAPPER,12	DEFINE A NEW BASE REGISTER,	AP819580
DROP	15	DROP THE OLD BASE REGISTER	AP819590
SPACE	5		AP819600
L	ALPHA,16(,1)	GET THE ADDRESS OF THE ALPHA ARRAY	AP819610
MVC	0(128,ALPHA),BLANKS	FILL IT WITH BLANKS	AP819620
SPACE	2		AP819630
L	TEMP5,12(,1)	GET THE ADDRESS OF THE HIGH INDEX	AP819640
L	TEMP4,8(,1)	AND OF THE LOW INDEX	AP819650
LA	INC,1	SET THE INCREMENT VALUE TO '1'	AP819660
L	INC+1,0(,TEMP5)	WE DEFINE THE TEST VALUE TO BE	AP819670
S	INC+1,0(,TEMP4)	(HIGH INDEX) - (LOW INDEX),	AP819680
L	INDEX2,0(,4)	WE NOW DETERMINE THE OFFSET FROM THE	AP819690
A	INDEX2,MINUSONE	PASSED ARRAY; THIS IS (LOW INDEX)	AP819700
LR	TEMP5,INDEX2	= 1, COPIED	AP819710
SLA	INDEX2,2(0)	MULTIPLY BY FOUR	AP819720
AR	TEMP5,INDEX2	AND MULTIPLY BY 5	AP819730
AR	ALPHA,TEMP5	WE CAN'T DOUBLE-INDEX SOME INSTRUCTI	AP819740
L	INPUT,4(,1)	GET THE ADDRESS OF THE ARRAY OF INTS	AP819750
L	TEMP4,0(,1)	GET THE ADDRESS OF THE FLAG,	AP819760
L	TEMP3,0(,TEMP4)	GET THE ACTUAL FLAG	AP819770
MVC	PATTERN(17),PATTERN1	MOVE IN THE FIRST EDIT PAT	AP819780
SR	INDEX1,INDEX1	CLEAR THE INDEX	AP819790
LTR	TEMP3,TEMP3	CHECK THE MAGNITUDE OF THE FLAG	AP819800

BP	FLOATING	IF THE FLAG IS >1, WE HAVE A FLTPT.	AP819810
MVC	PATTERN(17),PATTERN2	ELSE MOVE IN THE OTHER	AP819820
		EDIT PATTERN.	AP819830
	SPACE 3		AP819840
FLOATING	L	NUMBER,0(INDEX2,INPUT)	AP819850
	CVD	NUMBER,DECIMALS	AP819860
	MVC	EDITAREA(17),PATTERN	AP819870
	ED	EDITAREA(17),DECIMALS	AP819880
	MVC	0(9,ALPHA),EDITAREA+12	AP819890
		RECEIVING AREA,	AP819900
	LA	ALPHA,5(ALPHA)	AP819910
	LA	INDEX2,4(INDEX2)	AP819920
	BXLE	INDEX1,INC,FLOATING	AP819930
	SPACE 2		AP819940
	LM	14,12,12(13)	AP819950
	BR	14	AP819960
	SPACE 5	WHEN FINISHED, RESTORE THE REGS,	AP819970
		AND RETURN	AP819980
	LTORG		AP819990
DECIMALS	DS	10	AP820000
MINUSONE	DC	F'-1'	AP820010
EDITAREA	DC	CL17' 1	AP820020
PATTERN	DC	CL17' 1	AP820030
PATTERN1	DC	X'40202020202020202020202021204820'	AP820040
PATTERN2	DC	X'4020202020202020202020205C20202120'	AP820050
BLANKS	DC	CL128' 1	AP820060
	END		

SYMBOL GLOSSARY
ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
A(K)	--	30	Temporary storage array for use in the horizontal advection/diffusion calculations, and lower diagonal of tridiagonal matrix formed in vertical diffusion calculations
A(K,L) (BLKTD)	--	6x4	Lower diagonal matrices of block-tridiagonal matrix formed in vertical diffusion/chemical reaction calculations
AA(K,L)	--	6x4	Same as A(K,L)
ALPHA	--	Scalar	Chemical kinetics parameter
APRINT(I)	--	32	An alphanumeric array returned from subroutine MAPPER which contains pollutant concentrations appropriately distributed for printing on the program output.
B(K)	--	10	Diagonal of tridiagonal matrix formed in vertical diffusion calculations
B(K,I,J) (BLKTD)	--	6x4x4	Diagonal matrices of block-tridiagonal matrix formed in vertical diffusion/chemical reaction calculations
BB(K,I,J)	--	6x4x4	Same as B(K,I,J)
BC(L,I,J)	ppm	6x25x4	Boundary concentration of species L at a point of horizontal inflow into the model. L designates the chemical species, and J designates the border.

$$J = \begin{cases} 1 & \text{top} \\ 2 & \text{bottom} \\ 3 & \text{right} \\ 4 & \text{left} \end{cases}$$

I refers to the grid row or column number of the boundary point

SYMBOL GLOSSARY (Cont'd)
ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
BETA	--	Scalar	Chemical kinetics parameter
C(K)	--	10	Upper diagonal of the tridiagonal matrix formed in the vertical diffusion calculations
C(K,L) (BLOCKTD)	--	6x4	Upper diagonal matrices of the block-tridiagonal matrix formed in the vertical diffusion/chemical reaction calculations
CALOFT(L,I,J)	ppm	6x25x25	Concentration of species L aloft above grid square (I,J)
CBARM(L)	ppm	6	New and old values of the concentrations of species L just above the inversion base (boundary conditions)
CBARO(L)	ppm	6	
CC(K,L)	--	6x4	Same as C(K,L)
CC(I,J) (BLOCKTD)	--	4x4	Utility matrix used in the solution of the block tridiagonal system of linear equations
CONC(L,I,J,K)	ppm	6x25x25x6	Concentration of species L in grid cell (I,J,K)
CONCI(L,K,J)	ppm	6x25x25	Initial ground level concentration of species L in grid cell (I,J,I)
CSTART(L,K)	ppm	6x10	Taylor series estimate of the solution of the nonlinear system of equations; used as the first iterate in the Newton iteration procedure
CTOP(L)	ppm	6	Concentration of species L aloft

SYMBOL GLOSSARY (Cont'd)
ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
D(I,J) (BLCKTD)	--	4x4	Utility matrix used in the solution of the block-tridiagonal system of linear equations
DC(K,L)	ppm	6x4	Solution vector returned from subroutine BLCKTD
DELMO	--	Scalar	Vertical grid spacing (DELMO = 1/NOZ)
DELT	minute	Scalar	Designates a time interval
DELTAH(I,J)	feet/minute	25x25	Time rate of change of the mixing depth at grid square (I,J)
DELTAx	feet	Scalar	x-direction grid spacing
DELTAy	feet	Scalar	y-direction grid spacing
DT	minute	Scalar	Integration time step size
DTAVEC	minute	Scalar	Time interval over which instantaneous predictions are to be averaged (DTAVEC=60 yields hourly averages)
DTCHNG	--	Scalar	If DTCHNG=.TRUE., program may alter the size of the integration time step.
DTMAX	minute	Scalar	Maximum allowable integration time step size
DTMIN	minute	Scalar	Minimum allowable integration time step size
DTOLD	minute	Scalar	Time step used for the previous integration sequence

SYMBOL GLOSSARY (Cont'd)
ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
EPS	--	Scalar	Chemical kinetics parameter
F(K,L) (BLOCKTD)	--	6x4	Right hand side of the block-tridiagonal system of linear equations
FACTOR(L)	--	6	Allows convenient units to be used for input/output of the concentration of species L $\text{FACTOR(L)} = \begin{cases} 1. & \text{for ppm} \\ 10. & \text{for pptm} \\ 100. & \text{for ppbm} \end{cases}$
FACTRK(I)	--	24	Measure of the light intensity; fraction of nominal photolysis reaction rate constant; for example, $k_1 = \text{FKO}(1) \cdot \text{FACTRK}(I)$ at (I-1) x 100 hours
FLUX1	ppm-ft	Scalar	Concentration change in cell (I,J,K) due to advection/diffusion between cells (I-1,J,K) and (I,J,K) or cells (I,J-1,K) and (I,J,K)
FLUX2	ppm-ft	Scalar	Concentration change in cell (I,J,K) due to advection/diffusion between cells (I,J,K) and (I+1,J,K), or cells (I,J,K) and (I,J+1,K)
GM	--	Scalar	$KY \cdot \Delta T / \Delta T_{AX}^2$ or $KY \cdot \Delta T / \Delta T_{AY}^2$
GM(K,I,J) (BLOCKTD)	--	6x4x4	Utility matrix used in the solution of the block-tridiagonal system of linear equations
GMWA	--	Scalar	Chemical kinetics parameter
HENIS(I)	feet	15	Height at which point source I emits pollutants
HIGH(I,J,M)	feet	27x27x2	Old (M-1) and new (M-2) values of the mixing depth at grid square (I-1,J-1)

SYMBOL GLOSSARY (Cont'd)
ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
HOLD(L,K)	ppm	4x10	Utility array; used for temporary storage of concentrations calculated in the vertical diffusion/chemical reaction calculations
HORIG(I,J)	feet	25x25	Mixing depth at the start of a simulation at grid square (I,J)
HTOP	feet	Scalar	Mixing depth above which the ambient pollutant concentration is CALOFT (see CALOFT)
IBOTOM(I)	--	25	Defines the bottom (south) border of the modeling region; the smallest row number contained in grid column I
IFAIL	--	Scalar	I-coordinate of the last grid column in which a vertical diffusion/chemical reaction calculation was made
IHOLD(I)	--	25	An array containing the pollutant concentrations for a particular grid row; used by subroutine MAPPER to compute the array APRINT
IJPTS(IPTS)	--	45	Integers designating the grid coordinates, (I,J), of vertical columns of grid cells into which point source emissions are to be distributed I = IJPTS(IPTS)/100 J = IJPTS(IPTS)-I*100
ILEFT(J)	--	25	Defines the left hand border of the modeling region; the smallest column number contained in grid row J
IPSNXT	--	Scalar	Column number of the next vertical column of grid cells receive point source emissions

SYMBOL GLOSSARY (Cont'd)
ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
IPTS	--	Scalar	A counter used in the distribution of point source emissions
IRIGHT(J)	--	25	Defines the right hand border of the modeling region; the largest column number contained in grid row J
ISEQ	--	Scalar	An integer which controls the sequencing of the x and y advection/diffusion calculations If ISEQ = $\begin{cases} 1 & \text{do x direction first} \\ 2 & \text{do y direction first} \end{cases}$
ISPEC(L)	--	6	Logical variable that defines which chemical species are to be simulated. If ISPEC(L)=.TRUE., then simulate species L.
ITER	--	Scalar	Iteration counter
ITERN	--	Scalar	Total number of iterations required in the present integration time step
ITERO	--	Scalar	Total number of iterations taken in the previous integration time step
ITMAX	--	Scalar	Maximum number of iterations required in any vertical column of grid cells for convergence during the vertical diffusion/chemical reaction calculations
ITOP(I)	--	25	Defines the top (north) border of the modeling region; the largest row number contained in grid column I.
IVECNC(L,I,J)	--	6x25x25	Time integrated ground level concentration of species L in grid cell (I,J,1)
IVESTA(L,I)	--	6x15	Time integrated ground level concentration of species L at monitoring station I

SYMBOL GLOSSARY (Cont'd)
ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
JTAIL	--	Scalar	J-coordinates of the last vertical grid column in which a vertical diffusion/reaction calculation was made
JPSNXT	--	Scalar	Row number of the next vertical grid column of cells to receive point source emissions
KXY	feet ² /minute	Scalar	Horizontal turbulent diffusivity
KZ(K)	feet ² /minute	11	Vertical turbulent diffusivity, applicable at the interface between grid cells (I,J,K-1) and (I,J,K)
KZMAX	feet ² /minute	Scalar	Maximum (plateau) value of the vertical turbulent diffusivity
KZMIN	feet ² /minute	Scalar	Ground-level value of vertical turbulent diffusivity
LANDMK(I,J)	--	8x5	Alphanumeric designation of landmark I; to be printed on program output to provide a convenient point of reference; usually a geographical location, such as PACIFIC OCEAN, SAN GABRIEL MTS., and etc.
LEDRON	--	Scalar	Grid row number of the next landmark to be printed
M (BLOCKTD)	--	Scalar	Size of the individual block matrices (MxM) in the block-tridiagonal matrix
M (TIME)	--	Scalar	Integer which controls the type of arithmetic operation to be performed in subroutine TIME

SYMBOL GLOSSARY (Cont'd)
ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
MAXITR	--	Scalar	Maximum number of iterations allowed in the Newton solution of the nonlinear finite-difference equations.
MAXPTS	--	Scalar	Total number of vertical columns of grid cells into which point source emissions will be distributed
ML	--	Scalar	Landmark counter
MPASS	--	Scalar	A general utility variable passed to various subroutines through the blank COMMON.
MS			Station counter
N	--	Scalar	Size of the block tridiagonal matrix; corresponds to the number of vertical strata (N=NOZ)
NAME(L)	--	6	Alphanumeric designation of the name of species L. For example, if L = 1 (hydrocarbon), NAME(1) = 'HC'.
NOLAND	--	Scalar	Maximum number of landmarks to be printed (see LANDMK)
NOPTS	--	Scalar	Maximum number of point sources
NORATE	--	Scalar	Maximum number of chemical reactions
NORXN	--	Scalar	If NORXN=.TRUE., then only chemically inert species are being simulated
NOSG	--	Scalar	Number of vertical columns of grid cells into which emissions from a particular point source are to be distributed

SYMBOL GLOSSARY (Cont'd)
ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
NOSPEC	--	Scalar	Maximum number of chemical species that can be simulated simultaneously
NOSTN	--	Scalar	Number of special points in the modeling region at which pollutant concentrations will be calculated (for example, air quality monitoring stations)
NOTE(I)	--	40	Alphanumeric information to be printed on the program output. This is a user-supplied comment to help identify the purpose of the simulation
NOX	--	Scalar	Maximum number of grid points in the x-direction to be employed in defining the modeling region
NOY	--	Scalar	Maximum number of grid points in the y-direction to be employed in defining the modeling region
NOZ	--	Scalar	Number of vertical strata to be employed on modeling grid
NOZM1	--	Scalar	NOZM1 = NOZ-1
PRTDT	minutes	Scalar	Time interval between printouts of instantaneous ground level pollutant concentrations
PSFLAG	--	Scalar	Logical variable; if PSFLAG=TRUE., then there will be point source emissions into the column of grid cells currently being processed in Step III of the numerical integration procedure.
PTMIS(L,I)	pound mole/hour	6x15	Rate of emissions of species L from point source I

SYMBOL GLOSSARY (Cont'd)
ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
PUNCH	--	Scalar	If PUNCH=.TRUE., the entire pollutant concentration distribution will be dumped onto peripheral storage at the end of the simulation. These dumped concentrations can be used as initial conditions to continue the simulation at another time.
QNEW(L,I,J)	ppm-ft/min	6x25x25	Initial ground level emissions flux of species L into grid cell (I,J,I). Also designates the "new value" of the emissions flux during the numerical integration
QOLD(L,I,J)	ppm-ft/min	6x25x25	"Old value" of the ground level emissions flux of species L into grid cell (I,J,I)
QPTS(L,IPTS)	ppm-ft/min	6x45	Flux of species L from point sources; distributed uniformly in all grid cells above grid square (I,J), where $I = \text{IJPTS(IPTS)}/100$ $J = \text{IJPTS(IPTS)} - I * 100$
QSLOPE(L,I,J)	ppm-ft/min ²	6x25x25	Time rate of change of the ground level emissions flux of species L into grid cell (I,J,I)
R (PTSOUR)	--	Scalar	The length of the point source emissions "distribution line" in a particular grid square
R(I,J)	min ⁻¹	4x4	Jacobian of the chemical kinetics rate expressions
RATE(L)	ppm/min	4	$R(I,J) = - \frac{\partial(\text{rate expression for species I})}{\partial(\text{concentration of species J})}$ Rate of production of species L by chemical reaction

SYMBOL GLOSSARY (Cont'd)
ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
REGION(I)	--	20	Alphanumeric designation of the modeling area to be simulated (geographical location, such as 'LOS ANGELES'). This appears at the top of the printed output.
ERROR	--	Scalar	Relative error tolerance which must be attained before the Newton iteration stops
RESTART	--	Scalar	If RESTART=TRUE., then the simulation will start from the results attained in a previous simulation, thus carrying the previous simulation further ahead in time (see PUNCH)
RK(K)	ppm-min	15	Rate constant for chemical reaction K
RKO(K)	ppm-min	15	Nominal chemical reaction K rate constant
STNAME(I,J)	--	16x5	Alphanumeric designation of station I to be printed on the ground level concentration maps to show where the station is located (see NOSTN, XSTN, YSTN)
STNRON	--	Scalar	Integer denoting the next row in which a station name will be printed
T1 (AVCONC)	2400 time	Scalar	Beginning of the time period over which ground level concentrations are to be averaged
T1 (TIME)	2400 time	Scalar	Time
T2 (AVCONC)	2400 time	Scalar	End of the time interval over which ground level concentrations have been time integrated

SYMBOL GLOSSARY (Cont'd)
ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
T2 (TIME)	2400 time or minutes	Scalar	Time
TDATA	2400 time	Scalar	Beginning of a time interval over which a particular set of input data are applicable (see TNEXT)
TEMETTS(I,J)	--	15x24	Fraction of nominal emissions from point source I emitted during hour J. J=1 corresponds to the time period: midnight - 1 A.M.
THIGH	2400 time	Scalar	Time at which "new" values of the mixing depth are applicable
THIGHO	2400 time	Scalar	Time at which "old" values of the mixing depth are applicable
TIMEZN	--	Scalar	Alphanumeric designation of the local time zone (for Los Angeles, TIMEZN = 'PST')
TINTNX	2400 time	Scalar	Time at which next hourly-averaged concentrations are to be calculated and printed on the program output
TLNGTH	--	Scalar	Total length of the point source emissions "distribution line"
TNEXT	2400 time	Scalar	End of the time interval over which a particular set of input data are applicable (see TDATA)
TOTIME	2400 time	Scalar	Current simulation time
TQNEW	2400 time	Scalar	Time at which "new" values of the ground level emissions fluxes are applicable

SYMBOL GLOSSARY (Cont'd)
ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
TQOLD	2400 time	Scalar	Time at which "old" values of the ground level emissions fluxes are applicable
TSTART	2400 time	Scalar	Time at which simulation is to start
TSTOP	2400 time	Scalar	Time at which simulation is to terminate
UNIT(L)	--	6	Alphameric designation of the concentration units for species L that are printed on the program output (see FACTOR(L)).
WINDAN(I,J)	radians	25x25	Direction in which the wind is flowing at grid square (I,J); measured clockwise from north.
WINDMG(I,J)	feet/min	25x25	Wind speed at grid square (I,J)
WX(I,J)	feet/min	26x26	x-component of wind velocity at the interface between grid squares (I-1,J) and (I,J)
WY(I,J)	feet/min	26x26	y-component of wind velocity at the interface between grid squares (I,J-1) and (I,J)
WZO WZN	feet/min	Scalar	Old and new values of vertical transport velocity
X(I)	ppm	10	Solution vector returned from subroutine SIMDIG
X(I) (PTSOUR)		4	x-coordinates of the line segments making up the point source emissions "distribution line"
X(K,L) (BLOCKTD)		6x4	Solution vector calculated in subroutine BLOCKTD

SYMBOL GLOSSARY (Cont'd)
ATMOSPHERIC POLLUTION SIMULATION PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
XLAND(I)	--	8	x-coordinate of landmark I - see LANDMK(I,J)
XPTS(I)	--	15	x-coordinate of point source I - see PTENIS(L,I)
XSTN(I)	--	16	x-coordinate of station I - see STNAME(I,J)
Y(I)	--	10	Right hand side of the tridiagonal system of linear equations
Y(I) (PTSOUR)	--	4	y-coordinates of the line segments making up the point source emissions "distribution line"
Y(K,L) (BLCKTD)	--	6x4	Right hand side (known vector) of the block tridiagonal system of linear equation
Y1(K,I)	--	6x3	Utility array used to establish the right hand side of the tridiagonal system of linear equations.
YLAND(I)	--	8	y-coordinate of landmark I
YPTS(I)	--	15	y-coordinate of point source I
YSTN(I)	--	16	y-coordinate of station I
YY(K,L)	--	6x4	Same as F(K,L)
YY1(K,L)	--	6x4	Utility array for use in computing YY(K,L)

URBAN SCALE AIR POLLUTION SIMULATION MODEL OF

LOS ANGELES, CALIFORNIA AND VICINITY

INPUT PARAMETERS

MESH SPACING IN X DIRECTION 1.055000E 04 MESH SPACING IN Y DIRECTION 1.054000E 04

NUMBER OF MESH POINTS IN X-DIRECTION 25 NUMBER OF MESH POINTS IN Y-DIRECTION 25

NUMBER OF VERTICAL MESH POINTS 5

RATE CONSTANTS

K(1) = 4.400000E-01
 K(2) = 2.760000E 04
 K(3) = 2.179999E 01
 K(4) = 5.9999973E-03
 K(5) = 9.9999964E-02
 K(6) = 4.9999985E-04
 K(7) = 5.9999950E-03
 K(8) = 2.000000E 02
 K(9) = 1.800000E 03
 K(10) = 1.000000E 01
 K(11) = 7.277500E 03
 K(12) = 9.4862500E 03
 K(13) = 1.869999E-03
 K(14) = 1.800000E 03
 K(15) = 1.378749E 01

CCPPENT

THREE DIMENSIONAL MODEL - VALIDATION FOR SEPTEMBER 29, 1969

VERTICAL CONCENTRATION PROFILES ABOVE SELECTED SITES AT 1100.00 PSY

RESEDA		MIXING DEPTH 1000.0 FEET	
HC (PPHM)	34.72	27.27	27.46
NO (PPHM)	2.19	1.81	1.62
O3 (PPHM)	18.94	19.17	18.81
NO2 (PPHM)	19.30	16.83	15.14
CO (PPM)	7.90	7.00	5.28
URHC (PPTH)	27.69	26.38	25.09
			23.27
			21.07

OURLANK		MIXING DEPTH 950.0 FEET	
HC (PPHM)	36.51	25.39	24.23
NO (PPHM)	2.50	2.17	1.99
O3 (PPHM)	20.99	20.75	20.08
NO2 (PPHM)	27.83	23.99	21.30
CO (PPM)	8.91	7.73	6.84
URHC (PPTH)	31.31	29.31	27.52
			25.21
			22.60

PASADENA		MIXING DEPTH 1000.0 FEET	
HC (PPHM)	51.88	44.67	41.35
NO (PPHM)	1.55	1.41	1.36
O3 (PPHM)	33.01	33.21	32.67
NO2 (PPHM)	27.43	25.19	23.94
CO (PPM)	9.82	9.12	8.65
URHC (PPTH)	33.70	32.44	32.08
			30.90
			29.11

AZUSA		MIXING DEPTH 1000.0 FEET	
HC (PPHM)	36.10	29.54	25.24
NO (PPHM)	1.07	0.98	0.95
O3 (PPHM)	24.27	22.55	20.41
NO2 (PPHM)	13.95	11.95	10.47
CO (PPM)	6.71	5.27	5.14
URHC (PPTH)	34.10	31.37	29.09
			25.80
			22.24

EL MONTE		MIXING DEPTH 1000.0 FEET	
HC (PPHM)	51.23	43.15	38.60
NO (PPHM)	1.24	1.13	1.10
O3 (PPHM)	39.11	38.25	36.21
NO2 (PPHM)	25.91	23.14	21.20
CO (PPM)	10.10	9.20	8.45
URHC (PPTH)	36.19	34.53	32.84
			30.28
			26.94

DOWNTOWN LA		MIXING DEPTH 820.0 FEET	
HC (PPHM)	43.80	37.05	24.84
NO (PPHM)	6.05	3.87	3.13
O3 (PPHM)	4.50	6.15	6.63
NO2 (PPHM)	15.31	12.60	11.00
CO (PPM)	5.40	4.33	3.81
URHC (PPTH)	20.21	19.28	18.69
			18.04
			17.39

POMONA		MIXING DEPTH 1000.0 FEET	
MC (PPHM)	25.84	21.70	13.27
NC (PPHM)	1.17	1.08	1.04
O3 (PPHM)	17.28	15.08	13.35
NO2 (PPHM)	10.75	9.38	8.44
CO (PPH)	5.18	4.10	3.49
UNHC (PPTM)	34.10	31.68	29.38

WEST LA		MIXING DEPTH 630.0 FEET	
MC (PPHM)	29.69	22.83	17.34
NC (PPHM)	2.95	2.07	1.67
O3 (PPHM)	8.28	5.64	4.13
NO2 (PPHM)	12.18	10.40	9.61
CO (PPH)	4.17	3.59	3.36
UNHC (PPTM)	17.40	17.05	16.91

COMMERCE		MIXING DEPTH 500.0 FEET	
MC (PPHM)	40.36	30.13	25.61
NC (PPHM)	6.05	4.36	3.69
O3 (PPHM)	5.01	5.93	6.35
NO2 (PPHM)	15.56	13.45	12.21
CO (PPH)	4.57	3.85	3.48
UNHC (PPTM)	20.49	19.43	18.83

LENNOX		MIXING DEPTH 640.0 FEET	
MC (PPHM)	22.65	15.92	11.76
NC (PPHM)	5.78	4.11	3.48
O3 (PPHM)	4.20	5.11	5.53
NO2 (PPHM)	12.07	10.66	9.80
CO (PPH)	3.23	2.74	2.57
UNHC (PPTM)	17.50	16.91	16.74

WHITTIER		MIXING DEPTH 870.0 FEET	
MC (PPHM)	52.19	46.10	42.37
NC (PPHM)	1.79	1.60	1.53
O3 (PPHM)	30.84	30.70	29.67
NO2 (PPHM)	29.03	28.18	27.17
CO (PPH)	9.24	8.59	8.04
UNHC (PPTM)	33.38	32.22	31.07

LA HABRA		MIXING DEPTH 500.0 FEET	
MC (PPHM)	38.86	31.86	27.34
NC (PPHM)	1.39	1.29	1.21
O3 (PPHM)	26.92	25.92	24.53
NO2 (PPHM)	19.57	17.52	16.04
CO (PPH)	7.42	6.75	6.23
UNHC (PPTM)	34.64	33.01	31.46

LONG BEACH		MIXING DEPTH 650.0 FEET	
MC (PPHM)	32.48	24.55	22.01
NO (PPHM)	9.82	5.83	4.58
C3 (PPHM)	1.94	2.72	3.10
NO2 (PPHM)	9.61	8.27	7.43
CO (PPM)	4.01	3.36	3.16
URHC (PPTM)	20.10	19.41	19.18
ANAPHEM		MIXING DEPTH 620.0 FEET	
MC (PPHM)	47.71	39.29	34.09
NO (PPHM)	2.31	1.90	1.78
O3 (PPHM)	18.09	18.50	17.12
NO2 (PPHM)	22.16	18.85	16.42
CC (PPM)	8.45	7.41	6.56
URHC (PPTM)	37.66	36.08	33.51
SANTA ANA		MIXING DEPTH 650.0 FEET	
MC (PPHM)	39.16	35.17	32.52
NO (PPHM)	3.72	3.14	2.68
O3 (PPHM)	7.09	7.53	7.50
NO2 (PPHM)	13.85	13.07	11.48
CO (PPM)	5.03	4.73	4.28
URHC (PPTM)	22.21	22.04	21.89

HC GROUND LEVEL CONCENTRATIONS (PPHM) AT 1100.00 PST

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

25 10.1 24.7 29.0 32.4 35.0 36.5 31.2 26.2 20.3 17.1 15.8

24 23.0 35.3 39.1 40.1 42.9 40.3 37.6 32.8 27.7 23.8 21.5

23 26.7 38.4 40.1 40.4 44.4 43.5 47.9 39.9 33.2 27.0 23.7 26.8 28.7

22 24.6 31.7 30.9 31.1 35.7 40.6 41.7 39.4 36.7 34.1 29.7 32.4 35.2 37.4 36.1 32.4

21 14.7 20.3 20.5 22.2 27.1 31.5 33.2 36.1 37.5 38.2 35.5 42.1 42.4 45.4 44.9 41.6 38.5 36.1 35.1 34.1 33.8 33.4 32.7 30.8 27.7

20 7.0 8.2 10.4 11.3 16.8 20.9 26.1 34.1 42.5 44.6 48.8 49.4 50.4 52.1 52.6 45.1 44.7 41.1 38.5 36.2 36.4 37.3 37.4 34.6 29.8

19 6.5 8.3 10.4 12.7 19.1 26.6 34.7 45.4 54.3 54.9 52.6 51.5 51.4 53.9 56.1 54.7 51.7 46.8 41.2 37.0 36.1 37.6 37.5 35.9 24.9

18 6.8 9.5 12.7 15.9 23.3 34.8 43.8 49.6 51.0 50.4 49.1 48.9 45.4 51.3 54.7 56.2 55.9 52.1 44.4 37.6 35.6 35.6 29.3 27.7

17 8.7 11.4 13.7 15.6 20.6 31.4 34.7 37.0 38.6 39.2 42.2 44.2 45.5 47.1 45.0 51.3 53.7 51.8 43.0 36.2 32.7 29.4 27.2 25.0 24.0

16 8.6 15.9 19.3 24.3 25.1 27.9 30.5 35.9 38.7 41.2 43.5 45.8 49.5 52.6 50.1 43.2 37.8 32.9 29.2 26.8 23.7 20.9

15 7.9 12.4 17.2 21.8 25.7 29.6 32.7 33.9 34.6 31.6 42.9 47.8 52.6 52.0 46.0 39.3 30.3 26.4 24.3 22.4 20.4

14 8.5 15.2 23.4 26.8 27.2 29.0 28.5 30.1 31.9 39.3 47.5 52.0 55.1 50.2 39.0 29.0 24.5 24.6 23.9 22.0

13 6.7 15.7 22.3 24.8 24.7 25.9 26.1 27.2 30.2 35.7 44.1 50.2 53.7 51.0 42.0 31.7 27.0 26.6 26.4 24.5

12 13.0 17.7 21.1 24.1 25.1 25.5 26.9 28.4 32.4 35.9 47.7 51.0 49.5 41.2 32.9 29.0 28.8 27.3

11 7.9 12.6 20.8 25.3 26.3 24.3 25.7 28.1 32.6 30.6 44.4 49.3 52.1 47.7 43.3 39.0 35.3 32.2 29.5

10 6.6 13.6 20.3 22.9 26.0 25.5 27.7 30.8 36.9 42.7 46.7 50.0 53.0 52.5 50.3 46.3 41.8 37.5 32.7

9 7.5 12.7 17.5 21.2 24.4 28.9 33.1 35.4 40.6 43.7 46.8 47.8 48.6 47.9 48.5 45.5 41.7 39.4 34.6

8 9.5 12.0 14.9 19.2 24.1 28.5 32.9 36.2 39.1 43.6 44.7 44.4 44.5 44.5 45.8 47.3 46.3 44.4 38.5

7 10.4 11.4 12.7 17.6 22.4 25.6 28.7 30.7 32.9 36.2 37.1 39.1 40.9 42.4 44.2 45.6 48.2 46.7 39.5

6 10.2 11.5 14.1 21.2 24.5 25.3 26.0 27.0 28.1 30.0 32.2 35.0 38.2 38.0 37.8 38.6 39.9 39.1 34.8

5 26.4 30.0 35.3 37.8 37.6 36.0 35.2 33.2 31.7

4 26.5 32.0 36.8 40.6 41.9 40.3 37.7 35.6

3 26.5 31.6 39.1 39.7 38.5 36.5 35.3

2 26.0 33.7 39.7 39.4 37.0 34.8

1 26.1 30.5 36.3 37.1 35.3

NO GROUND LEVEL CONCENTRATIONS (PPHM) AT 1100.00 PST

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
25	1.4	1.2	1.1	1.2	1.6	2.1	2.9	3.6	4.1	4.3	3.8														
24	1.2	1.1	1.0	1.0	1.3	1.5	2.0	2.6	3.1	3.6	3.5														
23	1.5	1.4	1.4	1.5	1.6	1.6	1.8	2.1	2.4	2.9	2.8	2.4	1.5												
22	2.3	2.4	2.5	2.8	3.2	2.9	2.5	2.3	2.4	2.6	2.5	2.2	1.8	1.8	2.0	1.8									
21	2.2	3.1	3.3	3.8	5.5	5.4	4.2	3.4	2.6	2.4	2.3	2.0	1.6	1.6	2.0	2.3	2.1	1.6	1.2	1.0	1.0	0.9	0.9	0.9	0.9
20	0.9	1.4	1.8	2.1	3.3	3.2	2.7	2.4	2.3	2.0	2.1	2.0	1.6	1.4	1.5	1.7	1.9	1.9	1.7	1.3	1.1	1.0	0.6	0.9	0.9
19	0.8	1.1	1.6	2.1	3.3	3.1	2.6	2.3	2.3	2.2	2.3	2.4	2.1	1.6	1.2	1.2	1.3	1.5	1.8	1.8	1.4	1.1	0.9	0.9	1.0
18	0.8	1.1	1.5	1.9	2.6	3.3	3.4	3.2	2.9	3.1	3.5	3.8	3.3	2.5	1.7	1.2	1.0	1.2	1.6	2.2	1.9	1.3	1.0	1.0	1.2
17	0.8	1.0	1.3	1.4	1.8	3.1	3.5	4.2	4.8	5.1	6.1	6.0	5.4	4.1	2.5	1.4	1.0	1.0	1.3	1.9	1.9	1.3	1.0	1.0	1.2
16					0.9	1.4	1.8	2.5	2.7	3.6	4.9	6.9	7.1	6.7	5.5	3.5	2.0	1.2	1.0	1.1	1.6	1.9	1.6	1.2	1.2
15					0.8	1.2	1.8	2.5	3.7	5.5	7.1	6.7	6.2	6.3	5.2	2.9	1.7	1.1	1.0	1.3	1.8	1.8	1.4	1.1	1.2
14																									
13																									
12																									
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1																									

SAN GABRIEL MTS

RESERVA

HURDANK

PASADENA

EL MONTE

DOWNTOWN LA

WEST LA

CCPERCE

LENNOX

WHITTIER LA HABRA

LONG BEACH

ANANEIM

PALOS VERDES

PACIFIC OCEAN

SANTA ANA

0.7 1.1 1.9 2.6 2.9

0.8 1.6 3.2 4.3 4.5 3.7

0.7 1.1 1.9 2.6 2.9

0.8 1.6 3.2 4.3 4.5 3.7

0.7 1.1 1.9 2.6 2.9

0.8 1.6 3.2 4.3 4.5 3.7

0.7 1.1 1.9 2.6 2.9

0.8 1.6 3.2 4.3 4.5 3.7

0.7 1.1 1.9 2.6 2.9

0.8 1.6 3.2 4.3 4.5 3.7

0.7 1.1 1.9 2.6 2.9

0.8 1.6 3.2 4.3 4.5 3.7

0.7 1.1 1.9 2.6 2.9

0.8 1.6 3.2 4.3 4.5 3.7

0.7 1.1 1.9 2.6 2.9

0.8 1.6 3.2 4.3 4.5 3.7

0.7 1.1 1.9 2.6 2.9

0.8 1.6 3.2 4.3 4.5 3.7

0.7 1.1 1.9 2.6 2.9

0.8 1.6 3.2 4.3 4.5 3.7

0.7 1.1 1.9 2.6 2.9

0.8 1.6 3.2 4.3 4.5 3.7

03 GROUND LEVEL CONCENTRATIONS (PPHM) AT 1100.00 PST																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
25	13.0	21.5	26.4	27.1	21.9	16.7	12.4	9.5	7.0	5.8	5.6													
24	18.9	32.2	38.6	39.5	34.7	29.0	23.5	18.2	13.7	10.6	9.4													
23	16.6	26.9	23.3	29.8	30.5	30.6	29.5	26.1	21.8	17.7	15.1	14.7	15.6											
22	9.6	12.8	12.3	11.6	12.0	15.6	19.7	22.5	23.2	21.0	19.1	19.4	22.2	20.6	14.4	12.0								
21	5.3	6.0	5.9	5.2	4.4	5.5	8.2	12.6	18.3	21.3	21.8	24.0	25.1	25.8	20.2	14.1	15.6	17.2	20.6	23.5	24.7	25.0	25.1	24.8
20	9.0	7.3	6.2	5.4	4.7	6.2	9.4	14.2	19.3	23.5	23.4	24.9	29.7	35.9	34.1	28.6	23.4	19.6	18.7	20.9	24.2	27.1	28.3	27.5
19	9.9	8.8	7.0	5.5	4.9	7.1	11.7	17.0	20.7	21.6	20.0	18.5	21.9	29.8	39.3	43.6	40.1	31.2	21.5	17.2	19.7	24.8	28.0	27.2
18	11.2	10.7	8.7	7.4	7.0	7.7	9.8	11.9	13.7	12.5	11.0	10.2	12.1	17.1	26.2	32.4	45.3	41.5	28.1	16.6	14.9	19.9	23.7	23.0
17	10.6	10.4	9.4	9.3	9.6	8.1	7.6	6.4	5.5	5.2	4.6	5.0	6.3	9.4	16.8	29.2	40.6	42.5	32.4	20.1	15.2	17.3	19.2	18.1
16	10.6	9.9	9.9	8.5	7.3	5.2	3.8	3.0	3.3	4.1	6.1	11.6	22.0	34.1	40.8	36.3	25.1	17.0	14.8	14.9	14.3	12.8		
15	10.6	10.2	9.3	7.8	5.5	3.7	2.8	3.0	3.5	4.5	7.6	16.2	28.5	38.9	39.4	29.7	18.6	13.4	12.9	12.8	11.6			
14	9.7	8.2	5.8	4.7	4.1	3.3	3.0	3.0	3.2	5.3	11.4	23.4	35.7	39.4	30.7	18.5	12.6	12.1	12.4	11.2				
13	8.2	5.4	4.0	4.5	4.4	3.4	2.8	2.5	2.6	3.7	7.2	16.6	30.2	37.0	30.3	18.2	11.5	11.1	11.8	11.2				
12	3.5	4.4	4.4	3.5	2.7	2.4	2.4	2.4	2.6	3.1	5.3	11.9	25.0	33.6	30.6	26.3	12.6	10.2	10.3	10.8				
11	8.1	5.7	2.8	2.4	2.3	2.5	2.6	2.6	3.0	4.7	11.1	22.6	30.7	30.4	22.9	15.8	12.0	10.7	10.3					
10	8.3	5.9	3.3	3.3	2.8	2.3	2.2	2.3	2.7	4.3	10.2	21.3	29.8	28.7	21.8	16.3	13.6	12.1	11.2					
9	8.2	7.2	6.0	4.8	3.5	1.4	1.6	2.2	2.8	4.2	8.0	15.4	22.7	24.1	19.2	14.8	13.1	15.4	12.5					
8	7.2	6.7	6.4	5.2	3.7	1.7	2.3	3.1	4.0	3.8	3.7	6.5	11.0	14.5	15.1	13.2	12.4	12.3	12.8					
7	5.8	7.4	8.6	7.6	6.1	5.5	5.5	5.5	5.8	6.1	5.0	4.7	5.4	6.9	8.6	10.0	11.0	10.9	10.9	10.9				
6	8.2	10.9	11.8	11.6	11.5	11.3	10.9	10.7	10.5	10.2	9.5	8.5	7.3	7.0	7.0	7.1	7.4	7.9	8.0					
5																								
4																								
3																								
2																								
1																								

NO2 GROUND LEVEL CONCENTRATIONS (PPHM) AT 1100.00 PST

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
25	9.4	13.6	15.3	17.2	18.2	18.8	19.0	18.0	15.3	13.0	11.3														
24	11.9	18.8	21.2	22.3	23.9	23.7	24.7	24.8	22.5	20.2	17.6														
23	13.1	20.6	22.3	23.7	26.8	26.7	27.9	28.7	27.8	26.2	22.8	19.0	15.7												
22	11.4	18.4	18.4	17.0	20.6	24.0	26.4	27.9	29.1	25.2	25.7	23.0	21.6	19.7	15.2	11.6									
21	5.9	9.5	10.2	10.3	12.5	15.3	18.2	22.2	25.6	27.1	26.6	25.9	25.4	25.2	22.1	18.3	16.2	14.8	13.5	13.1	12.6	12.2	12.0	11.9	11.3
20	3.8	5.2	6.0	6.0	9.0	10.4	13.7	18.3	23.3	24.5	26.7	26.2	26.4	27.5	27.8	25.9	23.4	20.1	17.0	14.7	14.1	14.2	14.0	13.4	12.5
19	3.8	5.3	6.1	6.3	8.4	11.8	16.2	21.2	25.2	25.6	24.8	24.3	24.3	25.3	26.5	27.5	27.3	25.2	21.1	16.6	14.4	14.4	14.3	13.4	12.7
18	4.7	6.2	7.1	7.5	9.6	13.5	17.5	20.3	21.4	21.5	20.4	20.4	21.1	22.6	24.3	25.0	25.0	26.1	24.2	15.0	14.8	13.6	12.9	12.0	11.8
17	4.6	5.7	6.3	6.9	8.7	12.6	13.8	13.5	13.6	13.4	14.3	13.6	17.6	20.3	22.2	22.5	22.7	23.7	23.3	19.6	15.0	11.7	10.3	9.8	9.7
16	4.7	6.9	8.8	10.8	10.2	9.7	9.6	10.7	12.2	14.2	17.7	21.5	23.2	22.9	22.1	22.0	21.0	21.0	21.0	16.8	12.3	9.0	8.8	8.2	
15	4.4	5.8	6.0	6.8	10.7	10.5	10.3	10.4	11.4	14.5	21.0	25.3	25.5	22.8	21.6	21.1	17.5	12.6	9.3	7.8	7.1				
14	4.4	6.7	11.1	12.6	11.6	10.4	9.4	9.8	12.7	19.2	27.2	28.8	26.2	23.2	21.0	17.3	12.7	9.7	7.9	7.1					
13	3.2	7.8	12.1	13.0	12.0	10.7	9.4	9.0	10.5	15.5	25.0	32.1	30.2	24.7	20.9	17.4	13.5	10.6	8.9	7.9					
12	8.8	10.2	12.0	12.7	11.4	9.4	8.5	9.2	12.9	21.6	32.3	32.3	25.4	19.7	17.0	14.4	11.8	10.1	9.2						
11	3.7	6.0	12.5	12.4	10.6	8.6	8.0	8.0	11.9	19.9	30.3	32.7	27.5	21.4	20.0	18.5	15.3	12.3	10.5						
10	3.2	6.8	10.0	9.2	8.4	8.1	8.4	9.4	12.7	20.4	31.0	35.2	30.9	25.0	22.3	20.8	18.7	16.3	13.6						
9	3.2	4.5	5.7	6.1	6.4	8.8	9.3	10.6	13.4	19.4	29.5	37.9	39.0	32.6	24.8	18.6	15.9	14.8							
8	3.1	4.0	5.2	6.0	6.5	8.7	9.2	10.1	11.8	17.3	27.3	37.2	42.5	39.1	26.5	21.2	17.0	16.8	15.8						
7	2.5	3.7	5.1	6.2	6.6	6.8	7.1	7.4	8.4	12.3	17.0	21.0	24.9	25.7	25.1	22.8	19.9	16.4	13.2						
6	3.1	4.3	5.2	6.4	6.6	6.5	6.4	6.4	6.6	7.4	8.6	10.0	12.1	13.7	15.7	17.0	16.3	13.5	10.2						
5																									
4																									
3																									
2																									
1																									

CO GROUND LEVEL CONCENTRATIONS (PPM) AT 1100.00 PST

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
25	5.3	7.4	8.2	8.6	7.8	7.1	6.4	5.7	4.9	4.5	4.4														
24	6.2	9.6	10.9	11.1	10.4	9.5	8.7	7.7	6.7	6.1	5.8														
23	6.1	9.2	9.8	10.0	10.9	10.5	10.3	9.7	8.7	7.8	6.8	6.5	6.4												
22	5.2	6.7	6.5	6.6	7.5	8.5	9.2	9.4	9.4	8.9	7.7	7.3	7.5	7.5	6.5	5.7									
21	3.2	4.2	4.3	4.5	5.2	6.0	6.6	7.6	8.5	8.8	8.6	8.6	8.8	9.0	8.0	7.1	6.8	6.6	6.6	6.4	6.4	6.3	6.4	6.2	5.8
20	2.2	2.6	3.0	3.2	3.9	4.6	5.5	6.8	8.3	8.8	9.2	9.1	9.3	10.0	10.0	9.3	8.5	7.7	7.1	6.7	6.7	7.0	7.1	6.7	6.0
19	2.1	2.4	2.8	3.2	4.1	5.0	6.2	7.8	9.1	9.2	8.7	8.3	8.3	9.2	10.3	10.4	9.3	7.8	6.7	6.5	7.0	7.1	6.6	5.9	
18	2.1	2.3	2.7	3.2	4.0	5.2	6.4	7.3	7.6	7.4	7.0	6.8	6.8	7.4	8.6	9.9	10.7	10.3	8.6	6.9	6.2	6.4	6.4	6.0	5.2
17	2.1	2.3	2.5	2.7	3.2	4.3	4.7	5.0	5.2	5.1	5.4	5.4	5.6	6.0	6.8	8.2	9.6	9.9	8.7	6.9	5.9	5.5	5.4	5.1	4.8
16	2.2	2.8	3.1	3.5	3.5	3.7	3.8	4.3	4.4	4.5	5.0	5.5	7.3	8.9	9.5	8.7	7.4	6.1	5.4	5.0	4.7	4.5			
15	2.1	2.5	2.9	3.2	3.4	3.7	3.9	3.8	3.7	4.2	5.4	6.9	8.6	9.4	9.0	7.5	5.5	5.2	4.9	4.6	4.3				
14	2.2	2.7	3.3	3.5	3.5	3.6	3.3	3.3	3.9	4.9	6.7	8.3	9.6	9.4	7.7	5.7	4.8	4.8	4.4						
13	2.1	2.7	3.2	3.4	3.3	3.3	3.2	3.2	3.5	4.4	6.1	7.8	9.3	9.5	8.0	5.9	4.9	4.8	4.5						
12	2.3	2.8	3.1	3.3	3.3	3.3	3.2	3.3	3.4	4.0	5.4	7.3	8.9	9.3	8.1	6.6	5.3	4.9	4.8	4.6					
11	2.2	2.5	3.2	3.4	3.4	3.4	3.2	3.3	3.6	4.2	5.3	6.9	8.7	9.7	9.3	8.2	7.0	5.9	5.2	4.8					
10	2.0	2.6	2.9	3.1	3.4	3.4	3.3	3.5	3.9	4.7	5.8	7.1	8.8	10.0	10.0	9.2	8.0	6.9	6.1	5.4					
9	2.0	2.4	2.8	3.0	3.2	3.4	3.9	4.5	5.1	5.8	6.8	8.1	9.2	9.3	8.8	7.7	6.8	6.4	5.9						
8	2.1	2.2	2.4	2.8	3.2	3.3	3.8	4.2	4.7	5.5	6.4	7.2	7.9	8.2	8.1	7.7	7.3	7.0	6.5						
7	2.0	2.1	2.2	2.5	2.8	3.1	3.4	3.7	4.2	4.7	5.1	5.7	6.2	6.6	6.9	7.0	7.2	7.0	6.3						
6	2.0	2.0	2.1	2.4	2.5	2.7	2.8	3.0	3.3	3.6	4.0	4.6	5.2	5.3	5.3	5.4	5.6	5.6	5.3						
5																									
4																									
3																									
2																									
1																									

URMC GROUND LEVEL CONCENTRATIONS (PPHM) AT 1100.00 PST

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
25	23.6	29.0	30.0	29.4	27.8	26.9	26.4	25.7	24.0	22.4	21.4														
24	25.9	32.3	34.5	34.2	32.8	31.1	30.0	28.6	26.6	25.1	24.0														
23	21.4	28.8	31.5	32.4	33.5	33.1	32.5	31.2	29.5	27.8	26.3	25.6	25.2												
22	20.4	23.5	24.1	25.3	27.6	30.1	31.6	31.8	31.4	30.3	28.9	28.0	29.8	28.7	24.2	21.6									
21	16.8	18.5	19.3	20.2	22.1	24.9	27.8	30.3	31.7	32.0	31.6	31.7	32.1	32.2	29.8	25.5	25.7	28.0	31.1	33.6	35.0	35.4	35.4	35.4	35.2
20	15.4	16.3	17.3	18.3	20.0	22.7	26.1	29.6	31.9	32.3	31.9	31.4	32.5	34.7	34.1	32.0	30.6	30.2	30.9	32.3	34.0	35.2	35.8	36.0	35.5
19	15.2	16.1	17.1	18.2	19.8	22.0	25.0	27.7	29.4	29.1	27.9	27.4	28.1	30.6	34.3	36.0	36.2	34.4	32.0	30.8	31.8	33.9	35.3	35.9	35.4
18	15.3	16.1	17.1	18.0	19.0	20.4	21.8	22.7	23.4	23.3	22.8	22.8	22.5	25.2	28.1	32.5	36.6	37.2	34.2	36.6	36.2	32.2	34.0	34.6	34.7
17	15.2	15.7	16.2	16.5	16.8	17.6	18.1	18.7	19.2	19.5	19.9	20.3	21.0	22.3	24.6	28.0	33.6	36.4	34.9	31.7	30.7	31.7	32.8	33.3	33.5
16	15.2	15.6	16.1	16.7	17.3	17.8	18.4	18.9	19.5	20.1	20.7	21.3	22.0	22.7	23.2	23.6	24.1	24.6	25.2	25.7	26.2	26.7	27.2	27.7	28.2
15	15.2	15.6	16.2	17.0	17.7	18.3	18.9	19.5	20.1	20.7	21.3	22.0	22.7	23.2	23.6	24.1	24.6	25.2	25.7	26.2	26.7	27.2	27.7	28.2	28.7
14	15.3	16.2	17.3	18.0	18.7	19.3	19.9	20.5	21.1	21.7	22.3	22.9	23.5	24.1	24.7	25.3	25.9	26.5	27.1	27.7	28.3	28.9	29.5	30.1	30.7
13	15.2	16.6	17.5	18.4	19.3	20.2	21.1	22.0	22.9	23.8	24.7	25.6	26.5	27.4	28.3	29.2	30.1	31.0	31.9	32.8	33.7	34.6	35.5	36.4	37.3
12	16.5	16.7	17.1	17.4	17.8	18.4	18.8	19.2	19.6	20.0	20.4	20.8	21.2	21.6	22.0	22.4	22.8	23.2	23.6	24.0	24.4	24.8	25.2	25.6	26.0
11	15.2	15.7	16.9	18.1	18.9	19.2	19.5	19.8	20.1	20.4	20.7	21.0	21.3	21.6	21.9	22.2	22.5	22.8	23.1	23.4	23.7	24.0	24.3	24.6	24.9
10	15.1	15.7	17.1	17.9	18.7	19.5	19.9	20.2	20.5	20.8	21.1	21.4	21.7	22.0	22.3	22.6	22.9	23.2	23.5	23.8	24.1	24.4	24.7	25.0	25.3
9	15.1	15.6	16.3	17.1	18.1	19.8	20.1	20.3	20.5	20.7	20.9	21.1	21.3	21.5	21.7	21.9	22.1	22.3	22.5	22.7	22.9	23.1	23.3	23.5	23.7
8	15.2	15.5	16.1	16.9	17.9	19.3	19.5	19.7	19.9	20.2	20.5	20.8	21.1	21.4	21.7	22.0	22.3	22.6	22.9	23.2	23.5	23.8	24.1	24.4	24.7
7	15.1	15.4	16.0	16.9	17.8	18.6	19.3	19.7	20.5	21.3	22.4	23.8	24.9	25.9	27.3	30.0	33.7	36.9	38.6						
6	15.1	15.5	16.0	16.8	17.3	18.3	19.1	19.8	20.4	21.4	22.6	24.0	25.5	27.0	28.5	30.8	32.8	35.0	37.3	39.2	41.2				
5																									
4																									
3																									
2																									
1																									

SAN GABRIEL MINS

RESEDA

SANTA MONICA MINS

PASADENA

EL MONTE

PODMONA

WEST LA

DOWNTOWN LA

LENEX

WHITTIER

ANAHEIM

LONG BEACH

PALOS VERDES

PACIFIC OCEAN

SANTA ANA

17.2 17.5 15.0 19.8 20.6 21.6 23.5

16.2 17.1 18.1 19.0 19.9 21.2

15.2 16.0 17.0 18.1 19.4

AVERAGE GROUND LEVEL CONCENTRATIONS (PPHM) OF HC BETWEEN THE HOURS OF 1100. AND 1200. PST

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
25	13	20	24	28	31	32	30	26	21	18	16														
24	16	28	33	35	37	36	34	31	27	24	21														
23	20	32	36	36	38	38	37	32	26	23	26	28													
22	19	27	29	29	32	36	37	36	34	33	30	33	35	37	37	34									
21	12	17	19	21	25	29	30	33	35	38	40	42	40	43	45	42	39	36	34	31	30	29	29	28	26
20	6	7	9	10	15	18	23	31	39	42	46	44	45	47	45	48	45	42	39	36	33	32	32	30	28
19	6	7	9	11	16	22	29	38	47	48	46	45	44	46	48	49	48	46	42	38	35	33	31	29	27
18	6	8	10	13	19	28	35	40	42	42	42	42	42	43	45	46	47	47	44	40	36	32	28	25	25
17	8	10	11	13	17	26	28	30	32	33	37	40	40	41	40	40	42	44	42	38	34	28	25	22	21
16																									
15																									
14																									
13																									
12																									
11																									
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5																									
4																									
3																									
2																									
1																									

SAN GABRIEL MTS

RESERVOIR

NURRANK

SANTA MONICA MTS

PASADENA

EL MONTE

POHOMA

WHITTIER

LA HABRA

COMMERCE

LENEX

LONG BEACH

ANAHEIM

PALOS VERDES

PACIFIC OCEAN

SANTA ANA

23 29 34 35 34

24 27 31 36 39 36 34

24 27 33 35 36 34 33

23 29 34 35 34

23 26 30 33 33

AVERAGE GROUND LEVEL CONCENTRATIONS (PPHM) OF NO BETWEEN THE HOURS OF 1100. AND 1200. PST

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
25	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
24	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
23	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
22	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
21	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
19	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
18	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
17	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
15	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

AVERAGE GROUND LEVEL CONCENTRATIONS (PPHM) OF O₃ BETWEEN THE HOURS OF 1100. AND 1200. PST

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25			
25	11	22	30	32	29	24	21	10	19	13	12																
24	13	29	39	42	39	34	30	27	24	20	18																
23	13	25	31	32	31	31	29	27	25	23	23	25															
22	8	13	14	13	15	10	21	23	25	26	28	31	34	31	25												
21	6	6	7	7	6	6	8	12	19	25	26	30	34	38	34	31	29	27	26	25	24	25	27	27			
20	8	8	7	6	7	9	14	20	26	26	26	28	34	40	42	41	38	34	30	26	24	24	26	27			
19	10	9	8	7	8	11	15	18	19	18	16	16	21	30	37	41	42	40	34	28	23	21	24	25			
18	11	11	9	8	8	10	11	11	11	9	8	8	10	15	23	32	39	41	37	29	22	19	20	20			
17	11	11	10	9	8	9	8	7	6	5	4	5	6	9	15	25	34	39	38	31	24	19	17	16			
16			11	10	9	9	9	7	6	5	4	4	5	7	11	20	30	38	39	34	24	17	14	13			
15					11	10	9	8	6	5	4	4	4	5	9	16	27	37	40	34	23	15	13	12			
14						10	8	5	5	5	4	4	4	4	6	13	23	35	39	34	23	15	12	12			
13							10	6	4	4	4	4	4	3	4	5	9	18	30	37	34	24	15	12	12		
12								5	5	4	4	3	3	3	3	4	7	16	28	36	35	26	17	13	12		
11									9	6	3	3	3	3	3	4	8	16	27	36	36	29	20	15	13		
10									10	7	4	4	4	3	3	3	4	8	17	28	36	35	28	21	17	15	
9										10	8	6	5	2	2	2	3	4	7	12	21	29	31	26	21	17	16
8											9	7	7	6	3	3	4	5	4	6	11	17	22	20	18	17	
7												8	8	9	10	10	9	9	7	7	9	11	13	15	16	16	
6													10	11	12	12	13	14	14	14	13	13	12	11	10	11	11
5																											
4																											
3																											
2																											
1																											

SAN GABRIEL MTS

PASADENA

EL MONTE

POYONA

WHITTIER LA HABRA

ANGELES

LONG BEACH

COMMERCE

DOWNTOWN LA

WEST LA

LENEX

PALOS VERDES

PACIFIC OCEAN

SANTA ANA

14 8 7 6 7 8 11

14 13 12 11 10 11

14 14 13 12 11

15 16 14 12 10 9

15 15 14 11 10 11 12

15 16 14 13 12 11

15 16 14 13 12 11

15 16 14 13 12 11

15 16 14 13 12 11

15 16 14 13 12 11

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15 16 14 13 12 11

15 16 14 13 12 11

15 16 14 13 12 11

AVERAGE GROUND LEVEL CONCENTRATIONS (PPHM) OF NC2 BETWEEN THE HOURS OF 1100. AND 1700. PST

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
25	7	11	13	15	16	17	17	17	17	16	15													
24	8	14	17	18	20	20	21	21	21	20	19													
23	9	16	19	20	22	22	23	24	23	23	22	21	19											
22	7	13	15	15	18	20	22	23	23	24	23	22	21	20	18	15								
21	4	7	9	10	12	13	15	18	21	23	23	23	22	21	20	18	16	15	14	12	12	11	10	10
20	3	4	5	6	7	9	12	16	20	21	23	22	22	22	21	20	19	18	16	14	13	12	11	11
19	3	4	5	6	8	10	13	17	21	21	21	20	20	21	22	22	21	20	19	17	16	14	13	11
18	4	5	6	7	8	11	14	16	17	17	16	16	17	18	20	21	21	20	20	18	17	14	12	10
17	4	4	5	6	7	10	11	12	12	12	13	13	14	15	17	18	19	20	19	18	16	14	11	9
16																								
15																								
14																								
13																								
12																								
11																								
10																								
9																								
8																								
7																								
6																								
5																								
4																								
3																								
2																								
1																								

9 AVERAGE GROUND LEVEL CONCENTRATIONS (PPM) OF CO BETWEEN THE HOURS OF 1100. AND 1200. PST																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
25	4	6	8	8	7	7	6	5	5	5														
24	5	8	10	10	9	8	8	7	6	6														
23	5	8	9	10	9	9	9	8	8	7	7	7												
22	4	5	6	6	7	8	8	8	8	8	8	8	8	8	7									
21	3	3	4	4	5	5	6	7	7	8	9	9	9	9	9	9	7	7	6	6	6	6	6	6
20	2	2	3	3	3	5	5	6	7	8	8	8	8	9	10	10	9	9	8	7	6	6	6	6
19	2	2	3	3	4	4	5	6	7	8	7	7	7	7	8	9	9	9	8	7	6	6	6	6
18	2	2	2	3	3	4	5	6	6	6	6	6	5	6	6	7	8	9	8	7	6	5	5	5
17	2	2	2	2	3	4	4	4	4	4	5	5	5	5	5	5	7	8	8	7	6	5	5	5
16	2	3	3	3	3	3	3	3	4	4	4	4	4	4	4	5	6	7	8	7	6	5	4	4
15	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5	6	7	8	7	6	5	4	4
14	2	3	3	3	3	3	3	3	3	3	3	3	3	4	4	5	6	7	8	7	5	4	4	4
13	2	3	3	3	3	3	3	3	3	3	3	3	3	3	4	5	6	7	8	7	6	5	4	4
12	2	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	5	7	8	8	7	5	4	4
11	2	2	3	3	3	3	3	3	3	3	3	3	3	4	4	5	7	8	9	9	8	7	6	5
10	2	2	3	3	3	3	3	3	3	3	3	3	3	4	4	5	6	7	9	10	9	7	6	6
9	2	2	3	3	3	3	3	3	3	3	3	3	3	4	4	5	6	7	8	9	9	7	7	6
8	2	2	2	3	3	3	3	3	3	3	3	3	4	4	4	5	6	6	7	8	8	7	7	7
7	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
6	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
5																								
4																								
3																								
2																								
1																								

AVERAGE GROUND LEVEL CONCENTRATIONS (PPHM) OF UHMG BETWEEN THE HOURS OF 1100. AND 1200. PST

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

25 20 26 29 29 28 26 26 25 24 23 22

24 21 28 32 32 31 30 29 28 28 26 25

23 20 26 29 30 31 30 30 29 28 27 27 28

22 18 21 22 23 25 27 28 29 30 30 30 31 31 29 26

21 16 17 18 19 20 22 24 27 29 31 31 30 31 32 32 30 29 29 30 30 31 31 32 33

20 15 16 16 17 19 20 23 26 28 29 29 29 29 30 30 31 31 31 31 31 31 31 31 32 33

19 15 15 16 17 18 20 21 23 24 24 24 23 23 25 27 30 31 32 33 32 31 30 30 31 32

18 15 15 16 17 18 18 19 20 20 20 20 20 20 21 23 25 28 31 32 32 31 30 30 30 31

17 15 15 16 16 17 17 17 18 19 19 19 19 20 21 22 24 27 31 33 33 32 31 30 30

16 15 15 16 16 17 17 17 18 18 19 19 20 20 22 24 27 31 33 33 32 31 30 30

15 15 16 16 17 17 18 18 18 19 19 20 21 23 27 31 33 33 31 30 31 32

14 15 16 17 17 18 18 18 18 19 19 21 23 27 30 33 32 30 30 32 33

13 15 16 17 17 18 18 18 18 19 19 20 22 26 29 32 33 31 30 32 34

12 16 16 17 17 18 18 19 19 19 20 22 25 29 32 34 34 32 32 33

11 15 16 16 17 18 19 19 19 20 21 22 25 29 34 36 37 35 34 34

10 15 16 17 17 18 19 19 20 20 21 22 25 30 34 37 38 37 36 36

9 15 16 16 17 17 18 19 20 21 22 24 28 32 35 36 37 37 37

8 15 15 16 16 17 18 19 19 20 21 22 23 25 28 30 33 35 37 38

7 15 15 16 16 17 18 19 19 20 21 21 22 23 24 26 27 30 33 36

6 15 15 16 16 17 17 18 19 19 20 21 22 23 25 27 30

5 18 19 20 21 21 22 22 24 26

4 17 18 19 20 20 21 22 24

3 16 17 18 19 20 21 22

2 16 16 17 18 19 20

1 15 15 16 17 18

PACIFIC OCEAN

SANTA ANA

ANAHEIM

WHITTIER

LA HABRA

EL MONTE

PASADENA

AZUSA

POMONA

DOWNTOWN LA

WEST LA

COMMERCE

LONG BEACH

PALOS VERDES

SANTA ANA

ANAHEIM

WHITTIER

LA HABRA

AVERAGE GROUND LEVEL CONCENTRATIONS AT SELECTED SITES BETWEEN THE HOURS OF 1100. AND 1200. PST

	HC	NO	O3	NC2	CC	URHC
	PMH	PMH	PMH	PMH	PMH	PMH
BESFOA	32	2	21	17	7	25
BURBANK	35	2	23	23	8	30
PASADENA	49	1	40	23	10	32
AZUSA	33	1	24	14	7	31
FL MONTE	46	1	39	21	9	31
DENNICNLLA	35	4	5	13	5	19
POMONA	23	1	18	9	5	31
WEST LA	25	2	9	10	4	17
CCPERCE	36	6	4	13	4	19
LEANDX	20	5	4	10	3	17
WHITTIER	42	3	21	26	7	27
LA MARPA	39	1	36	20	8	33
LONG BEACH	32	9	2	10	4	20
ANAHEIM	41	2	30	26	9	36
SANTA ANA	38	3	9	13	5	21

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C***** DPP0010
C* THE DATA PLOTTING PROGRAM * DPP0020
C* * DPP0030
C* * DPP0040
C* * DPP0050
C* WRITTEN BY: STEVEN D. REYNOLDS * DPP0060
C* * DPP0070
C* FOR * DPP0080
C* * DPP0090
C* SYSTEMS APPLICATIONS, INC. * DPP0100
C* 9418 WILSHIRE BLVD. * DPP0110
C* BEVERLY HILLS, CALIFORNIA 90212 * DPP0120
C* * DPP0130
C* * DPP0140
C* JCL INFORMATION * DPP0150
C* * DPP0160
C* FT05F001 CARD READER * DPP0170
C* FT06F001 PRINTER * DPP0180
C* * DPP0190
C* ALSO INCLUDE THE APPROPRIATE JCL FOR THE CALCOMP PLOTTER * DPP0200
C* * DPP0210
C***** DPP0220
C* DIMENSION ANAME(2),UNIT(6),NAME(6),A(16),STNAME(16,5),STDATA(16,6, * DPP0230
C* 1 12),STCORR(16,6,12),STPRED(16,6,12),STN(5),DATE(2),C(12),T(12), * DPP0240
C* 1 D(12),TPLOT(48),CPLOT(48),B(12),DATA(24) * DPP0250
C* DIMENSION CCORR(12),TCORR(12) * DPP0260
C* REAL NAME * DPP0270
C* DATA UNIT,NAME/4*4HPPHM,4HPPH,4HPPMC, 4H HC,4H NO,4H O3, * DPP0280
C* 1 4H NO2,4H CO,4H HC / * DPP0290
C* LOGICAL FIRST,LAST,PLSPEC(16,6),CORECT * DPP0300
C* * DPP0310
C* *** INITIALIZE ARRAYS * DPP0320
C* * DPP0330
C* DO 10 L=1,16 * DPP0340
C* DO 10 I=1,6 * DPP0350
C* DO 10 J=1,12 * DPP0360
C* STPRED(L,I,J)=0. * DPP0370
C* STDATA(L,I,J)=1. * DPP0380
C* STCORR(L,I,J)=0. * DPP0390
C* * DPP0400
C* *** INPUT CARD NO. 1-3 * DPP0410
C* * DPP0420
C* READ(5,100) NOSTN,NOHOUR,TSTART,CARRHC,CARUHC,DATE * DPP0430
C* READ(5,101) ((STNAME(L,K),K=1,5),(PLSPEC(L,K),K=1,6),L=1,NOSTN) * DPP0440
C* READ(5,102) LAST,ISTN,ISPEC,DATA * DPP0450
C* * DPP0460
C* *** FILL STATION MEASUREMENT ARRAY WITH THE APPROPRIATE HOURLY * DPP0470
C* AVERAGES * DPP0480
C* * DPP0490
C* I=INT(TSTART)/100 * DPP0500
C* DO 90 I=1,NOHOUR * DPP0510
C* I=I+1 * DPP0520
C* STDATA(ISTN,ISPEC,I)=DATA(I) * DPP0530
C* IF(.NOT.LAST) GO TO 1 * DPP0540
C* * DPP0550
C* *** INPUT CARD NO. 4 * DPP0560
C* * DPP0570
C* READ(5,104) LAST,ISTN,ISPEC,(STCORR(ISTN,ISPEC,I),I=1,NOHOUR) * DPP0580
C* IF(.NOT.LAST) GO TO 2 * DPP0590
C* * DPP0600

```

*** INPUT CARD NO. 5

3 READ(5,103,END=4) ISPEC,T1,(A(I),I=1,NOSTN)
 1 HOUR=INT(T1-TSTART)/100 + 1
 DO 5 I=1,NOSTN
 5 STPRED(I,ISPEC,1HOUR)=A(I)
 GO TO 3

*** CALCULATE VALUES OF THE ABSCISSA (TIME)

4 DO 6 I=1,NOMHOUR
 6 T(I)=(INT(TSTART)+(I-1)*100)/100
 TL=T(1) = 2.25*(T(NOMHOUR)-T(1))/5,
 TR=T(1) + (15.-2.25)*(T(NOMHOUR)-T(1))/5,
 M=1

*** IN THE NEXT SECTION OF THE CODE, CO AND TOTAL HYDROCARBON
 ARE PLOTTED

DO 50 L=5,6
 ANAME(1)=NAME(L)
 DO 11 K=1,NOSTN
 IF(L,EQ,6,AND,PLSPEC(K,1)) GO TO 53
 IF(.NOT,PLSPEC(K,L)) GO TO 11
 IF(L,EQ,5) GO TO 51

*** CONVERT REACTIVE AND UNREACTIVE HYDROCARBON PREDICTIONS TO
 TOTAL HYDROCARBON (PPMC)

53 DO 52 I=1,NOMHOUR
 A(I)=STPRED(K,1,I)*CARRHC/100. + STPRED(K,6,I)*CARUHC/10.
 STPRED(K,6,I)=A(I)
 52 CONTINUE
 51 CMAX=0.
 DO 18 I=1,5
 18 STN(I)=STNAME(K,I)
 CORECT=.FALSE.

*** FIND THE MAXIMUM CONCENTRATION TO BE PLOTTED, AND SET UP THE
 ONE DIMENSIONAL ARRAYS OF PREDICTIONS AND MEASUREMENTS THAT
 WILL BE PLOTTED IN SUBROUTINE PLOTXY

DO 12 I=1,NOMHOUR
 IF(STDATA(K,L,I).GT,CMAX) CMAX=STDATA(K,L,I)
 IF(STPRED(K,L,I)+STCORR(K,L,I).GT,CMAX) CMAX=STPRED(K,L,I)+STCORR(K,L,I)
 1 K,L,I
 C(I)=STPRED(K,L,I)
 B(I)=STCORR(K,L,I)
 IF(B(I).NE,0.) CORECT=.TRUE.
 D(I)=STDATA(K,L,I)
 12 CONTINUE

*** SCALE ORDINATE, IF NECESSARY, SO THAT NO DATA POINTS WILL
 BE PLOTTED IN THE TITLE BLOCK LOCATED IN THE UPPER RIGHT
 CORNER OF THE PLOT

FACT=5./7.
 IF(CORECT) FACT=4./7.
 MM=1
 14 IF(FLOAT(5*MM*7).GT,CMAX) GO TO 13

DPP0610
 DPP0620
 DPP0630
 DPP0640
 DPP0650
 DPP0660
 DPP0670
 DPP0680
 DPP0690
 DPP0700
 DPP0710
 DPP0720
 DPP0730
 DPP0740
 DPP0750
 DPP0760
 DPP0770
 DPP0780
 DPP0790
 DPP0800
 DPP0810
 DPP0820
 DPP0825
 DPP0830
 DPP0840
 DPP0850
 DPP0860
 DPP0870
 DPP0880
 DPP0890
 DPP0900
 DPP0910
 DPP0920
 DPP0930
 DPP0940
 DPP0950
 DPP0960
 DPP0970
 DPP0980
 DPP0990
 DPP1000
 DPP1010
 DPP1020
 DPP1030
 DPP1040
 DPP1050
 DPP1060
 DPP1070
 DPP1080
 DPP1090
 DPP1100
 DPP1110
 DPP1120
 DPP1130
 DPP1140
 DPP1150
 DPP1160
 DPP1170
 DPP1180
 DPP1190

	MM=MM+1	DPP1200
	GO TO 14	DPP1210
13	NY=CHAX/FLOAT(5*MM) + 1	DPP1220
	IF(NY,LT,2) NY=2	DPP1230
81	CHAX=5*MM*NY	DPP1240
	CCMAX=FACT*CHAX	DPP1250
	IM=NOHOUR=3	DPP1260
	IF(NOHOURLT,4) IM=NOHOUR	DPP1270
	DO 80 I=IM,NOHOUR	DPP1280
	IF(STDATA(K,L,I),GT,CCMAX) GO TO 82	DPP1290
	IF(STPRED(K,L,I)+STCORR(K,L,I),GT,CCMAX) GO TO 82	DPP1300
	GO TO 80	DPP1310
82	NY=NY+1	DPP1320
	IF(NY,LE,7) GO TO 81	DPP1330
	MM=MM+1	DPP1340
	GO TO 13	DPP1350
80	CONTINUE	DPP1360
	*** ESTABLISH THE LOCATION OF THE INTERSECTION OF THE TWO AXES	DPP1370
	GO TO (15,16),M	DPP1380
	X=2,	DPP1390
15	Y=5.5	DPP1400
	GO TO 17	DPP1410
16	X=2,	DPP1420
	Y=1,	DPP1430
	*** PLOT AND LABEL THE AXES, AND PLOT THE TITLE BLOCK IN THE	DPP1440
	UPPER RIGHT CORNER	DPP1450
	CALL LABEL(X,Y,NOHOUR,T,NY,CHAX,UNIT(L),DATE,STN,1,ANAME,CORRECT)	DPP1460
17	CBOT=-Y*CHAX/3.5	DPP1470
	CTOP=(10,-Y)*CHAX/3.5	DPP1480
	*** PLOT PREDICTED CONCENTRATIONS	DPP1490
	CALL PLOTXY(NOHOURLT,C,TL,TR,CBOT,CTOP,1,1,-1.)	DPP1500
	*** PLOT STATION MEASUREMENTS	DPP1510
	CALL PLOTXY(NOHOURLT,D,TL,TR,CBOT,CTOP,0,0,-1.)	DPP1520
	IF(.NOT,CORRECT) GO TO 20	DPP1530
	CALL CDASH(NOHOURLT,C,B,NOCORR,TCORR,CCORR)	DPP1540
	IF(NOCORR,LE,0) GO TO 20	DPP1550
	*** PLOT LOCALLY CORRECTED MODEL PREDICTIONS	DPP1560
	CALL PLOTXY(NOCORR,TCORR,CCORR,TL,TR,CBOT,CTOP,2,1,-1.)	DPP1570
20	IF(M,EQ,1) GO TO 21	DPP1580
	CALL SYSEND(-1,,0)	DPP1590
	M=1	DPP1600
	GO TO 11	DPP1610
21	M=2	DPP1620
11	CONTINUE	DPP1630
50	CONTINUE	DPP1640
	IF(M,EQ,2) CALL SYSEND(-1,,0)	DPP1650
	*** IN THE NEXT SECTION OF THE CODE, NO, NO2, AND OZONE ARE	DPP1660
	PLOTTED	DPP1670
		DPP1680
		DPP1690
		DPP1700
		DPP1710
		DPP1720
		DPP1730
		DPP1740
		DPP1750
		DPP1760
		DPP1770
		DPP1780
		DPP1790

DO 30 K=1,NOSTN
IF(.,NOT,PLSPEC(K,2),AND.,NOT,PLSPEC(K,3),AND.,NOT,PLSPEC(K,4)) GO
1 TO 30

*** CORRECT NO AND OZONE MEASUREMENTS FOR INTERFERENCES

DO 47 I=1,NOHOUR
IF(STDATA(K,2,I),EQ.,-1,) GO TO 45

*** A CORRECTION IS NOT MADE FOR NO MEASUREMENTS AT STATIONS
5 AND 9 (EL MONTE AND COMMERCE)

IF(K,EQ,5,OR,K,EQ,9) GO TO 45
STDATA(K,2,I)=STDATA(K,2,I)*1.25
IF(STDATA(K,3,I),EQ.,-1,) GO TO 47

*** A CORRECTION IS NOT MADE FOR OZONE MEASUREMENTS AT STATIONS
5, 9, AND 13 (EL MONTE, COMMERCE, AND LONG BEACH)

IF(K,EQ,13) GO TO 47
IF(K,EQ,5,OR,K,EQ,9) GO TO 47
IF(STDATA(K,1,I),EQ.,-1,) GO TO 46
STDATA(K,3,I)=STDATA(K,3,I) + STDATA(K,1,I)
IF(STDATA(K,4,I),EQ.,-1,) GO TO 47
STDATA(K,3,I)=STDATA(K,3,I) + 0.15*STDATA(K,4,I)
IF(STDATA(K,3,I),LT,0,) STDATA(K,3,I)=0,

CONTINUE

CHAX=0,

DO 31 I=1,5

STN(I)=STNAME(K,I)

CORRECT=,FALSE,

*** FIND MAXIMUM CONCENTRATION TO BE PLOTTED ON THE NO=NO2 PLOT

DO 32 I=1,NOHOUR
IF(STDATA(K,2,I),GT,CHAX) CHAX=STDATA(K,2,I)
IF(STDATA(K,4,I),GT,CHAX) CHAX=STDATA(K,4,I)
IF(STPRED(K,2,I)+STCORR(K,2,I),GT,CHAX)CHAX=STPRED(K,2,I)+STCORR(K
1,2,I)

IF(STPRED(K,4,I)+STCORR(K,4,I),GT,CHAX)CHAX=STPRED(K,4,I)+STCORR(K
1,4,I)

C(I)=STPRED(K,2,I)

B(I)=STCORR(K,2,I)

IF(B(I),GT,0,) CORRECT=,TRUE,

D(I)=STDATA(K,2,I)

CONTINUE

*** SCALE ORDINATE, IF NECESSARY, SO THAT NO DATA POINTS WILL
BE PLOTTED IN THE TITLE BLOCK

FACT=4./7.

IF(CORRECT) FACT=3./7.

MM=1

IF(FLOAT(5*MM*7),GT,CHAX) GO TO 34

MM=MM+1

GO TO 33

NY=CHAX/FLOAT(5*MM) + 1

IF(NY,LT,2) NY=2

CHAX=5*MM*NY

CCMAX=FACT*CHAX

DPP1800
DPP1810
DPP1820
DPP1830
DPP1840
DPP1850
DPP1860
DPP1870
DPP1880
DPP1890
DPP1900
DPP1910
DPP1920
DPP1930
DPP1940
DPP1950
DPP1960
DPP1970
DPP1980
DPP1990
DPP2000
DPP2010
DPP2020
DPP2030
DPP2040
DPP2050
DPP2060
DPP2070
DPP2080
DPP2090
DPP2100
DPP2110
DPP2120
DPP2130
DPP2140
DPP2150
DPP2160
DPP2170
DPP2180
DPP2190
DPP2200
DPP2210
DPP2220
DPP2230
DPP2240
DPP2250
DPP2260
DPP2270
DPP2280
DPP2290
DPP2300
DPP2310
DPP2320
DPP2330
DPP2340
DPP2350
DPP2360
DPP2370
DPP2380
DPP2390

```

IM=NOHOUR=3
IF(NOHOUR,LT,4) IM=NOHOUR
DO 83 I=IM,NOHOUR
IF(STDATA(K,2,I),GT,CCHAX) GO TO 84
IF(STDATA(K,4,I),GT,CCHAX) GO TO 84
IF(STPRED(K,2,I)+STCORR(K,2,I),GT,CCHAX) GO TO 84
IF(STPRED(K,4,I)+STCORR(K,4,I),GT,CCHAX) GO TO 84
GO TO 83
84 NY=NY+1
IF(NY,LE,7) GO TO 85
MM=MM+1
GO TO 34
83 CONTINUE
IF(,NOT,PLSPEC(K,2),AND,,NOT,PLSPEC(K,4)) GO TO 70
X=2,
Y=5,5
ANAME(1)=NAME(2)
ANAME(2)=NAME(4)

```

```

C C C *** DRAW AND LABEL THE AXES AND TITLE BLOCK OF THE NO=NO2 PLOT
CALL LABEL(X,Y,NOHOUR,T,NY,CCHAX,UNIT(2),DATE,STN,2,ANAME,CORRECT)
CBOT=-Y*CCHAX/3,5
CTOP=(10,-Y)*CCHAX/3,5
IF(,NOT,PLSPEC(K,2)) GO TO 89

```

```

C C C *** PLOT THE PREDICTED NO CONCENTRATIONS
CALL PLOTXY(NOHOUR,T,C,TL,TR,CBOT,CTOP,1,1,-1,)

```

```

C C C *** PLOT THE MEASURED NO CONCENTRATIONS
CALL PLOTXY(NOHOUR,T,D,TL,TR,CBOT,CTOP,0,0,-1,)
89 IF(,NOT,PLSPEC(K,4)) GO TO 70
CORRECT=.FALSE.
DO 36 I=1,NOHOUR
C(I)=STPRED(K,4,I)
D(I)=STDATA(K,4,I)
B(I)=STCORR(K,4,I)
36 CONTINUE

```

```

C C C *** PLOT THE PREDICTED NO2 CONCENTRATIONS
CALL PLOTXY(NOHOUR,T,C,TL,TR,CBOT,CTOP,2,1,-1,)

```

```

C C C *** PLOT THE MEASURED NO2 CONCENTRATIONS
CALL PLOTXY(NOHOUR,T,D,TL,TR,CBOT,CTOP,0,2,-1,)
70 IF(,NOT,PLSPEC(K,3)) GO TO 71
X=2,
Y=1,
ANAME(1)=NAME(3)
CCHAX=0,
CORRECT=.FALSE.

```

```

C C C *** FIND THE MAXIMUM OZONE CONCENTRATION TO BE PLOTTED

```

```

DO 42 I=1,NOHOUR
IF(STDATA(K,3,I),GT,CCHAX) CCHAX=STDATA(K,3,I)
IF(STPRED(K,3,I)+STCORR(K,3,I),GT,CCHAX) CCHAX=STPRED(K,3,I)+STCORR(K

```

DPP2400
DPP2410
DPP2420
DPP2430
DPP2440
DPP2450
DPP2460
DPP2470
DPP2480
DPP2490
DPP2500
DPP2510
DPP2520
DPP2530
DPP2540
DPP2550
DPP2560
DPP2570
DPP2580
DPP2590
DPP2600
DPP2610
DPP2620
DPP2630
DPP2635
DPP2640
DPP2650
DPP2660
DPP2670
DPP2680
DPP2690
DPP2700
DPP2710
DPP2715
DPP2720
DPP2730
DPP2740
DPP2750
DPP2760
DPP2770
DPP2780
DPP2790
DPP2800
DPP2810
DPP2820
DPP2830
DPP2840
DPP2850
DPP2860
DPP2870
DPP2880
DPP2890
DPP2900
DPP2910
DPP2920
DPP2930
DPP2940
DPP2950
DPP2960
DPP2970

	1,3,I)		DPP2980
	C(I)=STPRED(K,3,I)		DPP2990
	B(I)=STCORR(K,3,I)		DPP3000
	IF(B(I).GT.0.) CORECT=.TRUE.		DPP3010
	D(I)=STDATA(K,3,I)		DPP3020
42	CONTINUE		DPP3030
C			DPP3040
C	*** SCALE THE ORDINATE, IF NECESSARY, SO THAT NO DATA POINTS		DPP3050
C	WILL BE PLOTTED IN THE TITLE BLOCK		DPP3060
C			DPP3070
	FACT=5./7.		DPP3080
	IF(CORECT) FACT=4./7.		DPP3090
	MM=1		DPP3100
43	IF(FLOAT(5*MM*7).GT.CMAX) GO TO 44		DPP3110
	MM=MM+1		DPP3120
	GO TO 43		DPP3130
44	NY=CMAX/FLOAT(5*MM) + 1		DPP3140
	IF(NY.LT.2) NY=2		DPP3150
48	CMAX=5*MM*NY		DPP3160
	CCHAX=FACT*CMAX		DPP3170
	IM=NOHOUR+3		DPP3180
	IF(NOHOURLT.4) IM=NOHOUR		DPP3190
	DO 86 I=IM,NOHOUR		DPP3200
	IF(STDATA(K,3,I).GT.CCHAX) GO TO 87		DPP3210
	IF(STPRED(K,3,I)+STCORR(K,3,I).GT.CCHAX) GO TO 87		DPP3220
	GO TO 86		DPP3230
87	NY=NY+1		DPP3240
	IF(NY.LE.7) GO TO 48		DPP3250
	MM=MM+1		DPP3260
	GO TO 44		DPP3270
86	CONTINUE		DPP3280
C			DPP3290
C	*** DRAW AND LABEL THE AXES AND TITLE BLOCK FOR THE OZONE PLOT		DPP3300
C			DPP3310
	CALL LABEL(X,Y,NOHOUR,T,NY,CMAX,UNIT(3),DATE,STN,1,ANAKE,CORECT)		DPP3320
	CBOT=Y*CMAX/3.5		DPP3330
	CTOP=(10.-Y)*CMAX/3.5		DPP3340
C			DPP3350
C	*** PLOT THE PREDICTED OZONE CONCENTRATIONS		DPP3360
C			DPP3370
	CALL PLOTXY(NOHOURLT,C,TL,TR,CBOT,CTOP,1,1,-1.)		DPP3380
			DPP3390
	*** PLOT THE MEASURED OZONE CONCENTRATIONS		DPP3400
C			DPP3410
	CALL PLOTXY(NOHOURLT,D,TL,TR,CBOT,CTOP,0,0,-1.)		DPP3420
71	CALL SYSEND(=1.,0)		DPP3430
30	CONTINUE		DPP3440
	CALL SYSEND(=1.,0)		DPP3450
	STOP		DPP3460
C			DPP3470
C	*** FORMATS		DPP3480
C			DPP3490
100	FORMAT(2I5,3F10.0,2A4)		DPP3500
101	FORMAT(5A4,6L1)		DPP3510
102	FORMAT(6X,L3,2I2,19X,24F2.0)		DPP3520
103	FORMAT(4X,I6,F6.0,16F4.0)		DPP3530
104	FORMAT(L3,2I3,12F3.0)		DPP3540
105	FORMAT(16I5)		DPP3550
	END		DPP3560

SUBROUTINE CDASH(NOHOUR,T,C,B,NOCORR,TCORR,CCORR)
 DIMENSION T(12),C(12),B(12),TCORR(12),CCORR(12)

*** DETERMINE THE HOUR IMMEDIATELY PRECEDING THE THE FIRST
 HOUR AT WHICH A LOCAL CORRECTION IS TO BE MADE

DO 1 I=1,NOHOUR
 IF(B(I).LE.0.) GO TO 1
 ISTART=I-1
 IF(ISTART.LT.1) ISTART=1
 GO TO 2
 1 CONTINUE
 NOCORR=0
 RETURN
 2 I1=ISTART+1

*** DETERMINE THE HOUR IMMEDIATELY FOLLOWING THE LAST HOUR AT
 WHICH A LOCAL CORRECTION IS TO BE MADE

DO 3 II=1,NOHOUR
 I=NOHOUR+1-II
 IF(B(I).EQ.0.) GO TO 3
 ISTOP=I+1
 IF(ISTOP.GT.NOHOUR) ISTOP=NOHOUR
 GO TO 4
 3 CONTINUE
 ISTOP=NOHOUR
 4 NOCORR=ISTOP-ISTART+1
 J=0

*** CALCULATE THE ARRAYS OF ABSCISSA AND ORDINATES THAT ARE
 USED TO PLOT THE DASHED LINE REPRESENTING THE LOCALLY
 CORRECTED MODEL PREDICTIONS

DO 5 I=ISTART,ISTOP
 J=J+1
 TCORR(J)=T(I)
 5 CCORR(J)=B(I) + C(I)
 RETURN
 END

DPP3570
 DPP3580
 DPP3590
 DPP3600
 DPP3610
 DPP3620
 DPP3630
 DPP3640
 DPP3650
 DPP3660
 DPP3670
 DPP3680
 DPP3690
 DPP3700
 DPP3710
 DPP3720
 DPP3730
 DPP3740
 DPP3750
 DPP3760
 DPP3770
 DPP3780
 DPP3790
 DPP3800
 DPP3810
 DPP3820
 DPP3830
 DPP3840
 DPP3850
 DPP3860
 DPP3870
 DPP3880
 DPP3890
 DPP3900
 DPP3910
 DPP3920
 DPP3930
 DPP3940
 DPP3950
 DPP3960


```

SUBROUTINE LABEL(X,Y,N,XDATA,NY,YMAX,UNIT,DATE,STN,NO NAME,NAME,
1 CORECT)
LOGICAL CORECT
REAL NAME(2)
DIMENSION STN(5),DATE(2),XDATA(12),SYM(10)
DATA SYM/4H0000,4H1111,4H2222,4H3333,4H4444,4H5555,4H6666,4H7777,
1 4H8888,4H9999/,PPH/4HPPH /

```

```

*** DRAW THE X AND Y AXES

```

```

CALL SYSPLT(X,Y,3)

```

```

XX=X

```

```

DO 11 I=1,20

```

```

XX=XX+0.275

```

```

CALL SYSPLT(XX,Y,2)

```

```

CALL SYSPLT(X,Y,3)

```

```

YY=Y

```

```

DO 12 I=1,20

```

```

YY=YY+0.1875

```

```

CALL SYSPLT(X,YY,2)

```

```

*** DRAW TICK MARKS AND LABEL THE ABSCISSA (TIME)

```

```

CALL SYSPLT(X+0.25,Y,3)

```

```

XFR=5.00/FLOAT(N-1)

```

```

XX=X+0.25

```

```

DO 1 I=1,N

```

```

CALL SYSPLT(XX,Y+0.08,2)

```

```

J=XDATA(I)

```

```

IF(J.GT.9) GO TO 2

```

```

CALL SYSSYM(XX=0.025,Y=0.2,0.1,SYM(J+1),1,0.)

```

```

GO TO 3

```

```

J1=J/10

```

```

CALL SYSSYM(XX=0.07,Y=0.2,0.1,SYM(J1+1),1,0.)

```

```

J1=J-J1*10

```

```

CALL SYSSYM(XX=0.02,Y=0.2,0.1,SYM(J1+1),1,0.)

```

```

IF(I.EQ.N) GO TO 1

```

```

XX=XX+XFR

```

```

CALL SYSPLT(XX,Y,3)

```

```

CONTINUE

```

```

*** DRAW TICK MARKS AND LABEL THE ORDINATE (CONCENTRATION)

```

```

YFR=3.50/FLOAT(NY)

```

```

YY=Y

```

```

DO 4 I=1,NY

```

```

YY=YY+YFR

```

```

CALL SYSPLT(X,YY,3)

```

```

CALL SYSPLT(X+0.08,YY,2)

```

```

J100=0

```

```

J10=0

```

```

J1=0

```

```

JJ=I*YMAX/FLOAT(NY)

```

```

IF(JJ.LT.100) GO TO 5

```

```

J100=JJ/100

```

```

CALL SYSSYM(X=0.3,YY=0.05,0.1,SYM(J100+1),1,0.)

```

```

IF(JJ.LT.10) GO TO 6

```

```

J10=(JJ-100*J100)/10

```

```

CALL SYSSYM(X=.21,YY=0.05,0.1,SYM(J10+1),1,0.)

```

```

J1=(JJ-100*J100-10*J10)

```

DPP3970
DPP3980
DPP3990
DPP4000
DPP4010
DPP4020
DPP4030
DPP4040
DPP4050
DPP4060
DPP4070
DPP4080
DPP4090
DPP4100
DPP4110
DPP4120
DPP4130
DPP4140
DPP4150
DPP4160
DPP4170
DPP4180
DPP4190
DPP4200
DPP4210
DPP4220
DPP4230
DPP4240
DPP4250
DPP4260
DPP4270
DPP4280
DPP4290
DPP4300
DPP4310
DPP4320
DPP4330
DPP4340
DPP4350
DPP4360
DPP4370
DPP4380
DPP4390
DPP4400
DPP4410
DPP4420
DPP4430
DPP4440
DPP4450
DPP4460
DPP4470
DPP4480
DPP4490
DPP4500
DPP4510
DPP4520
DPP4530
DPP4540
DPP4550
DPP4560

```

4 CALL SYSSYM(X=,12,Y=0.05,0.1,SYM(J1+1),1,0,)
  CONTINUE
7 CALL SYSSYM(X=0.37,Y+1.27,0.13,'CONC (',6,90.)
  CALL SYSSYM(X=0.37,Y+1.96,0.13,UNIT,4,90.)
  Y1=Y+2.43
  IF(UNIT.EQ.PPM) Y1=Y1-0.11
8 CALL SYSSYM(X=0.37,Y1,0.13,')',1,90.)
9 CALL SYSSYM(X+2.,Y=.45,.13,'TIME (PST)',10,0.)
C
C
C *** PLOT THE TITLE BLOCK
CALL SYSSYM(X+3.35,Y+3.6,.15,STN,20,0.)
CALL SYSSYM(X+4.22,Y+3.4,0.1,DATE,8,0.)
CALL SYSSYM(X+3.95,Y+3.25,0.1,0.=1,0.)
CALL SYSSYM(X+4.2,Y+3.2,.1,'MEASURED ',9,0.)
CALL SYSSYM(X+5.05,Y+3.2,0.1,NAME(1),4,0.)
CALL SY8PLT(X+3.8,Y+3.05,3)
CALL SY8PLT(X+4.1,Y+3.05,2)
CALL SYSSYM(X+4.2,Y+3.,0.1,'PREDICTED',9,0.)
CALL SYSSYM(X+5.05,Y+3.,0.1,NAME(1),4,0.)
IF(.NOT.CORECT) GO TO 10
CALL SY8PLT(X+3.8,Y+2.85,3)
CALL SY8PLT(X+3.9,Y+2.85,2)
CALL SY8PLT(X+4.0,Y+2.85,3)
CALL SY8PLT(X+4.1,Y+2.85,2)
CALL SYSSYM(X+4.2,Y+2.8,0.1,'WITH LOCAL',10,0.)
CALL SYSSYM(X+4.2,Y+2.63,0.1,'CORRECTION',10,0.)
10 IF(NONAME.LE.1) RETURN
CALL SYSSYM(X+3.95,Y+2.85,0.1,2.=1,0.)
CALL SYSSYM(X+4.2,Y+2.8,0.1,'MEASURED ',9,0.)
CALL SYSSYM(X+5.05,Y+2.8,0.1,NAME(2),4,0.)
CALL SY8PLT(X+3.8,Y+2.65,3)
CALL SY8PLT(X+3.9,Y+2.65,2)
CALL SY8PLT(X+4.0,Y+2.65,3)
CALL SY8PLT(X+4.1,Y+2.65,2)
CALL SYSSYM(X+4.2,Y+2.6,0.1,'PREDICTED',9,0.)
CALL SYSSYM(X+5.05,Y+2.6,0.1,NAME(2),4,0.)
RETURN
END

```

```

DPP4570
DPP4580
DPP4590
DPP4600
DPP4610
DPP4620
DPP4630
DPP4640
DPP4650
DPP4660
DPP4670
DPP4680
DPP4690
DPP4700
DPP4710
DPP4720
DPP4730
DPP4740
DPP4750
DPP4760
DPP4770
DPP4780
DPP4790
DPP4800
DPP4810
DPP4820
DPP4830
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DPP4860
DPP4870
DPP4880
DPP4890
DPP4900
DPP4910
DPP4920
DPP4930
DPP4940
DPP4950

```

SUBROUTINE PLOTXY(N,X,Y,XMN,XX,YMN,YX,IP,ISYS,SUPRES)

*** NORMALLY, A 15-IN X 10-IN PLOTTING AREA IS USED, WHERE
THE LENGTH IN THE X DIRECTION IS 15 INCHES. IF THE USER
WISHES TO ALTER THE DIMENSIONS OF THE PLOTTING AREA, THEN
THE NEW DIMENSIONS SHOULD BE SPECIFIED IN A BLOCK DATA
SUBPROGRAM AS FOLLOWS:

BLOCK DATA

COMMON /COMPXY/ ITEST,XLNGTH,YLNGTH
END

*** WHERE ITEST IS SET EQUAL TO ONE, XLNGTH IS SET EQUAL TO THE
ALTERED X-LENGTH IN INCHES, AND YLNGTH IS SET EQUAL TO THE
ALTERED Y-LENGTH IN INCHES. NOTE THAT BOTH XLNGTH AND
YLNGTH MUST BE SPECIFIED, EVEN IF ONLY ONE IS TO BE ALTERED.

DIMENSION X(1),Y(1)
COMMON/COMPXY/ITEST,XLNGTH,YLNGTH
REAL LBOUND
INTEGER PEN

*** CHECK PARAMETER VALUES FOR POSSIBLE ERRORS

RBOUND = XX
IF (XMN,LE,XX) GO TO 5
RBOUND = XMN
5 CONTINUE
IF (YMN,LE,YX) GO TO 10
TBOUND = YMN
BBOUND = YX
10 CONTINUE
IF(ITEST .EQ. 1) GO TO 12
XLNGTH = 15.0
YLNGTH = 10.0
12 IF(N .GT. 0) GO TO 18
14 WRITE (6,16) N,XMN,XX,YMN,YX
16 FORMAT(' ERROR RETURN FROM 'PLOTXY'--ONE OF THE FOLLOWING ARGU
MENTS HAS WRONG VALUE'/10X,'N,XMN,XX,YMN,YX =',I10,4E18,6)
RETURN
18 IF(XX .EQ. XMN .OR. YX .EQ. YMN) GO TO 14

*** CALCULATE SCALING PARAMETERS

20 SX = XLNGTH/(XX-XMN)
SY = YLNGTH/(YX-YMN)
PEN = 3
MMMO

*** DO LOOP FOR PLOTTING EACH DATA POINT

DO 30 I = 1,N
IF(X(I) .GT. RBOUND) GO TO 28

*** CALCULATE THE LOCATION OF THE DATA POINT ON THE PLOT

XX = (X(I) - XMN)*SX
YY = (Y(I) - YMN)*SY
IF(IP .NE. 1) GO TO 22

DPP4960
DPP4970
DPP4980
DPP4990
DPP5000
DPP5010
DPP5020
DPP5030
DPP5040
DPP5050
DPP5060
DPP5070
DPP5080
DPP5090
DPP5100
DPP5110
DPP5120
DPP5130
DPP5140
DPP5150
DPP5160
DPP5170
DPP5180
DPP5190
DPP5200
DPP5210
DPP5220
DPP5230
DPP5240
DPP5250
DPP5260
DPP5270
DPP5280
DPP5290
DPP5300
DPP5310
DPP5320
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DPP5370
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DPP5460
DPP5470
DPP5480
DPP5490
DPP5500
DPP5510
DPP5520
DPP5530
DPP5540
DPP5550

*** ENTER HERE FOR SOLID LINE PLOT

IF(I,GT,1) GO TO 50
CALL SYSPLT(XX,YY,PEN)
PEN = 2
XOLD=XX
YOLD=YY
GO TO 30

*** EACH LINE SEGMENT TO BE PLOTTED IS DIVIDED INTO 5 SECTIONS
TO INSURE AN EVEN INK FLOW WHEN INDIA INK IS USED

50 DDY=(YY-YOLD)/5.
DDX=(XX-XOLD)/5.
XX1=XOLD
YY1=YOLD
DO 51 IIJ=1,5
XX1=XX1 + DDX
YY1=YY1 + DDY
51 CALL SYSPLT(XX1,YY1,2)
XOLD=XX
YOLD=YY
GO TO 30

22 IF(IP,NE,0) GO TO 24

*** ENTER HERE FOR A SYMBOL PLOT

IF(Y(I),EQ,SUPRES) GO TO 30
CALL SYSSYM(XX,YY,0,08,ISY8,=1,0)
GO TO 30

*** ENTER HERE FOR A DASHED LINE PLOT

24 IF(I,GT,1) GO TO 40
CALL SYSPLT(XX,YY,3)
X1=XX
Y1=YY
GO TO 30
40 TLNG=SQRT((X1-XX)**2 + (Y1-YY)**2)
DX=0.1*(X1-XX)/TLNG
DY=0.1*(Y1-YY)/TLNG
X2=X1
Y2=Y1
PEN=3

46 IF(X2,EQ,XX) GO TO 48
X2=X2+DX
IF(X2,LT,XX) GO TO 42
X2=XX
Y2=YY
PEN=2

GO TO 45
42 Y2=Y2+DY
GO TO (43,43,44),PEN

43 PEN=3
GO TO 45

44 PEN=2
45 CALL SYSPLT(X2,Y2,PEN)
GO TO 46

48 X1=XX
Y1=YY

DPP5560
DPP5570
DPP5580
DPP5590
DPP5600
DPP5610
DPP5620
DPP5630
DPP5640
DPP5650
DPP5660
DPP5670
DPP5680
DPP5690
DPP5700
DPP5710
DPP5720
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DPP5980
DPP5990
DPP6000
DPP6010
DPP6020
DPP6030
DPP6040
DPP6050
DPP6060
DPP6070
DPP6080
DPP6090
DPP6100
DPP6110
DPP6120
DPP6130
DPP6140
DPP6150

28 GO TO 30
PEN03
30 CONTINUE
RETURN
END

DPP6160
DPP6170
DPP6180
DPP6190
DPP6200

BLOCK DATA

*** THIS BLOCK DATA SUBPROGRAM IS EMPLOYED TO ALTER THE
DIMENSIONS OF THE PLOTTING AREA USED BY SUBROUTINE PLOTXY

COMMON /COMPXY/ IPXY,XPXY,YPXY
DATA IPXY,XPXY,YPXY /0,15,,10,/
END

DPP6210
DPP6220
DPP6230
DPP6240
DPP6250
DPP6260
DPP6270
DPP6280

SYMBOL GLOSSARY
DATA PLOTTING PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
ANAME(I)	--	2	Alphanumeric designation of the chemical species' name
B(I)	--	12	Utility array for storing local corrections
BOUND	--	Scalar	Value of the y-ordinate at the bottom of the plotting area
C(I)	--	12	Utility array for storing model predictions
CARREC	--	Scalar	Number of carbon atoms per reactive hydrocarbon molecule
CARREC	--	Scalar	Number of carbon atoms per unreactive hydrocarbon molecule
CBOT	--	Scalar	Concentration at the bottom of the plotting area
CCMAX	--	Scalar	Largest concentration that may be plotted under the title block in the upper right hand corner of each plot
CCORR(I)	--	12	Utility pollutant concentration array which contains model predictions augmented by local corrections
CWAX	--	Scalar	Largest concentration on y-ordinate
CORRECT	--	Scalar	Logical variable; if CORRECT=.TRUE., then local corrections are to be plotted.
CTOP	--	Scalar	Concentration at the top of the plotting area

SYMBOL GLOSSARY (Cont'd)
DATA PLOTTING PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
D(I)	--	12	Utility array for storing station measurements
DATA(I)	--	24	Utility array used for input of air quality measurements
DATE(I)	--	2	Alphabetic designation of the date
IP	--	Scalar	Integer controlling the type of plot to be produced
			$IP = \begin{cases} 0 & \text{symbol plot} \\ 1 & \text{line plot} \\ 2 & \text{dashed line plot} \end{cases}$
IPXY	--	Scalar	If IPXY = 0, then nominal 15 in. x 10 in. plotting area is used. If IPXY = 1, then the user may alter the area size by changing XPXY and/or YPXY in the BLOCK DATA sub-program.
ISPEC	--	Scalar	Number designating the chemical species
ISTN	--	Scalar	Monitoring station number
ISYS	--	Scalar	Integer designating the symbol to be plotted by subroutine SYSSYM
ITEST	--	Scalar	Same as IPXY
LAST	--	Scalar	Logical variable designating the end of a particular set of input data. $LAST = \begin{cases} .TRUE., & \text{no more input data} \\ .FALSE., & \text{more input data to follow} \end{cases}$

SYMBOL GLOSSARY (Cont'd)
DATA PLOTTING PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
N	--	Scalar	Number of data points to be plotted
NAME(L) (MAIN)	--	6	Alphanumeric designation of species' L name
NAME(I) (LABEL)	--	2	Same as NAME(I)
NOCORR	--	Scalar	Number of locally corrected data points to be plotted.
NOHOUR	--	Scalar	Number of hours of simulated data to be plotted
NONAME	--	Scalar	Number of chemical species to be plotted on the same graph
NOSTN	--	Scalar	Number of air quality monitoring stations
NY	--	Scalar	Number of intervals into which the y-axis is to be subdivided
PEN	--	Scalar	Integer controlling the pen position $PEN = \begin{cases} 2 & \text{pen down (on the paper)} \\ 3 & \text{pen up} \end{cases}$
PLSPEC(I,L)	--	16x6	Logical array designating which species are to be plotted at each station. If PLSPEC(I,L) = .TRUE., then species L is plotted at station I.
PPM	--	Scalar	Alphanumeric information, PPM='PPM'
BOUND	--	Scalar	Value of the abscissa at the right hand edge of the plotting area

SYMBOL GLOSSARY (Cont'd)
DATA PLOTTING PROGRAM

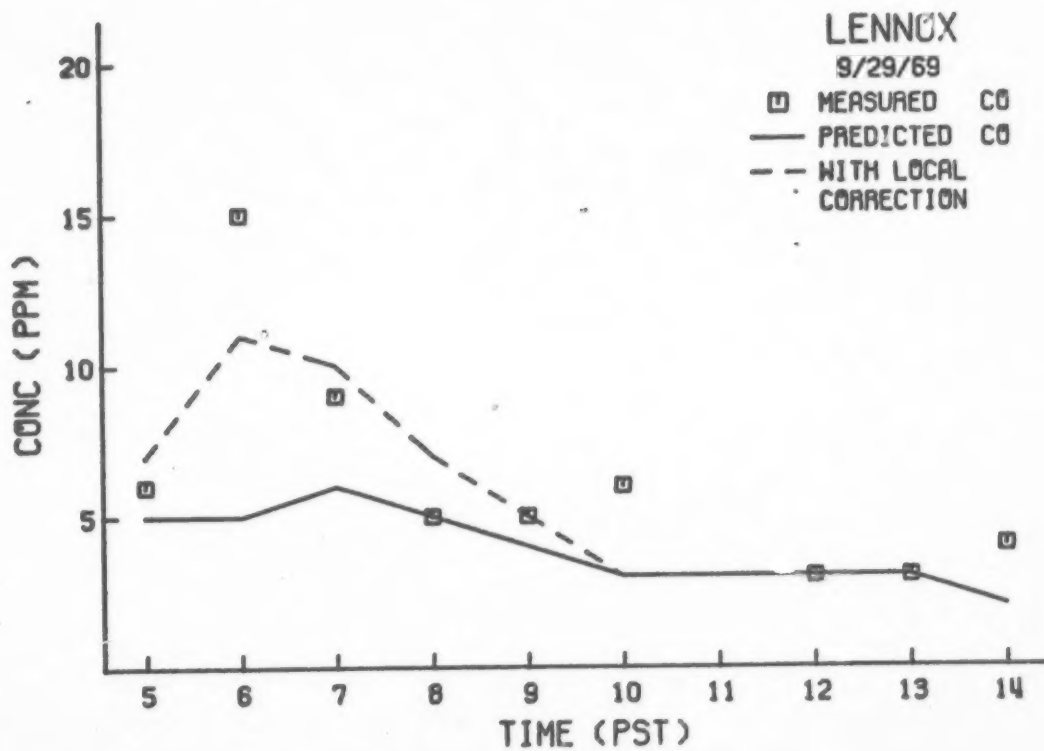
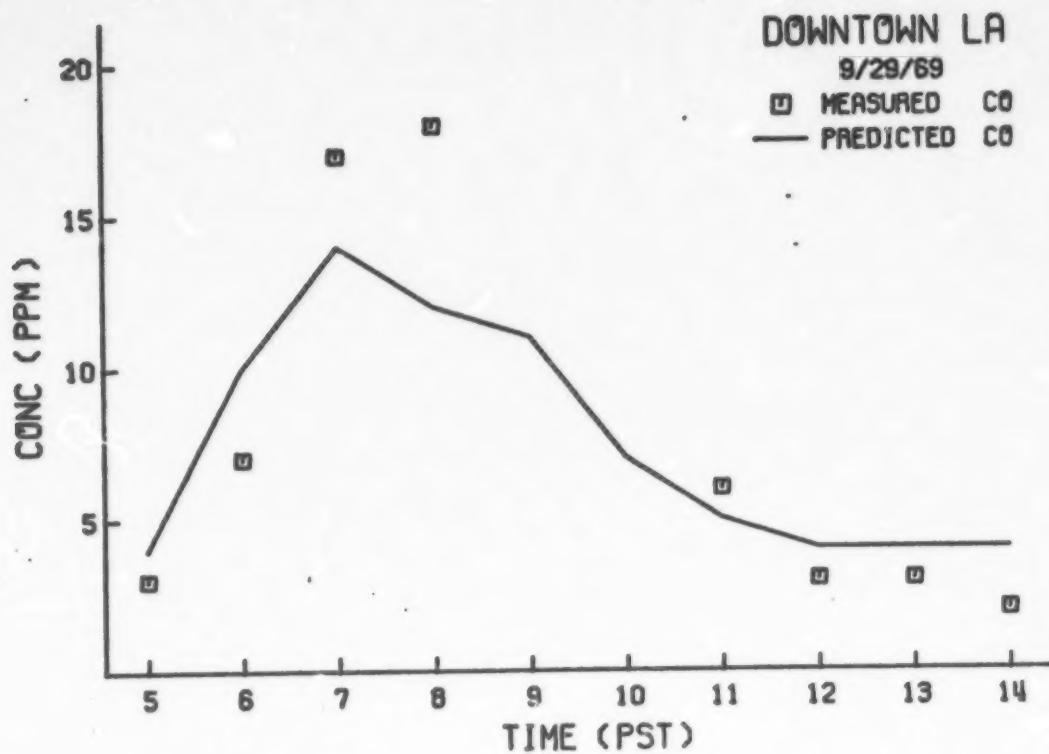
<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
STCORR(I,L,J)	--	16x6x12	Array of local corrections for species L at station I and hour J
			$L = \begin{cases} 1 & \text{reactive hydrocarbon} \\ 2 & \text{NO} \\ 3 & \text{O}_3 \\ 4 & \text{NO} \\ 5 & \text{CO}_2 \\ 6 & \text{unreactive hydrocarbon} \end{cases}$
STDATA(I,L,J)	--	16x6x12	Air quality measurement of species L at station I and hour J
			$L = \begin{cases} 1 & \text{SO}_2 \text{ (pphm)} \\ 2 & \text{NO} \text{ (pphm)} \\ 3 & \text{O}_3 \text{ (pphm)} \\ 4 & \text{NO}_2 \text{ (pphm)} \\ 5 & \text{CO} \text{ (ppm)} \\ 6 & \text{total hydrocarbon (ppmC)} \end{cases}$
STN(J)	--	5	Alphanumeric designation of the name or location of a particular monitoring station (for example, 'DOWNTOWN LA')
STNAME(I,J)	--	16x5	Alphanumeric designation of the name or location of monitoring station I
STPHED(I,L,J)	--	16x6x12	Concentrations predicted by the model for species L at station I and hour J
			$L = \begin{cases} 1 & \text{reactive hydrocarbon} \\ 2 & \text{NO} \\ 3 & \text{O}_3 \\ 4 & \text{NO}_2 \\ 5 & \text{CO} \\ 6 & \text{unreactive hydrocarbon} \end{cases}$

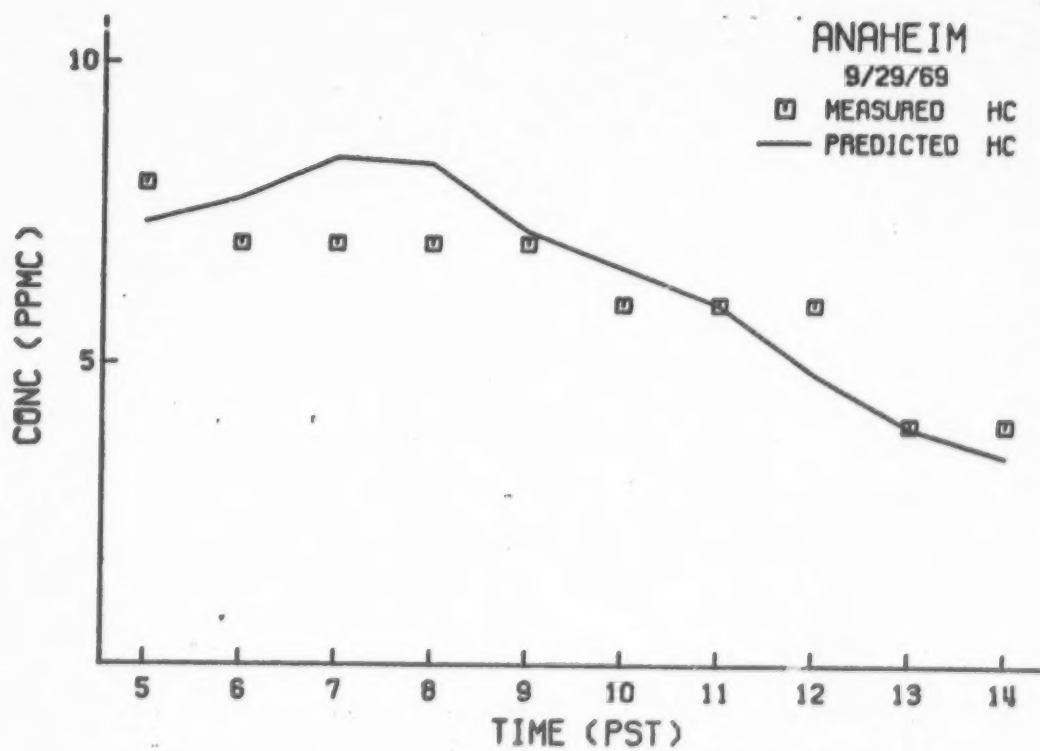
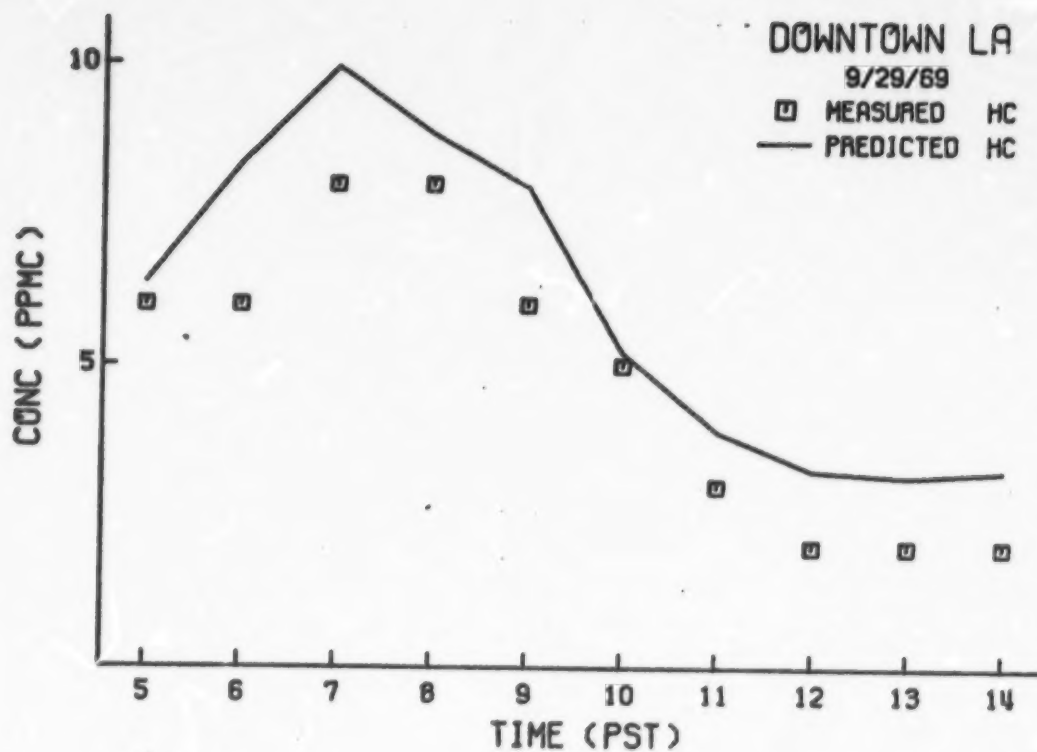
SYMBOL GLOSSARY (Cont'd)
DATA PLOTTING PROGRAM

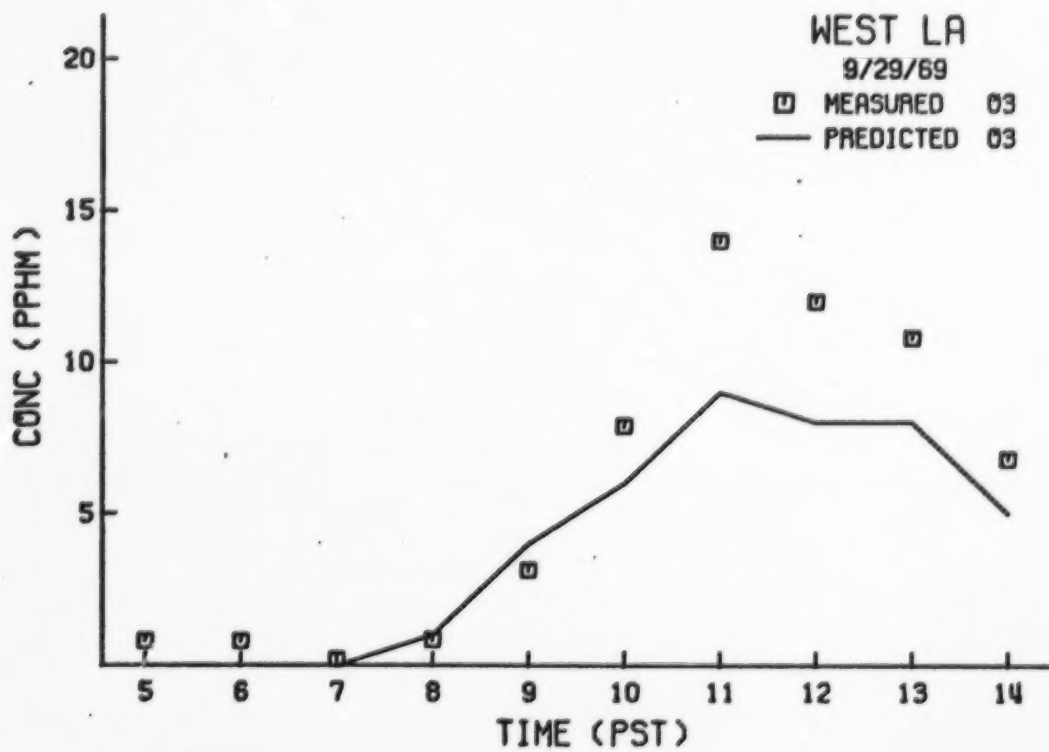
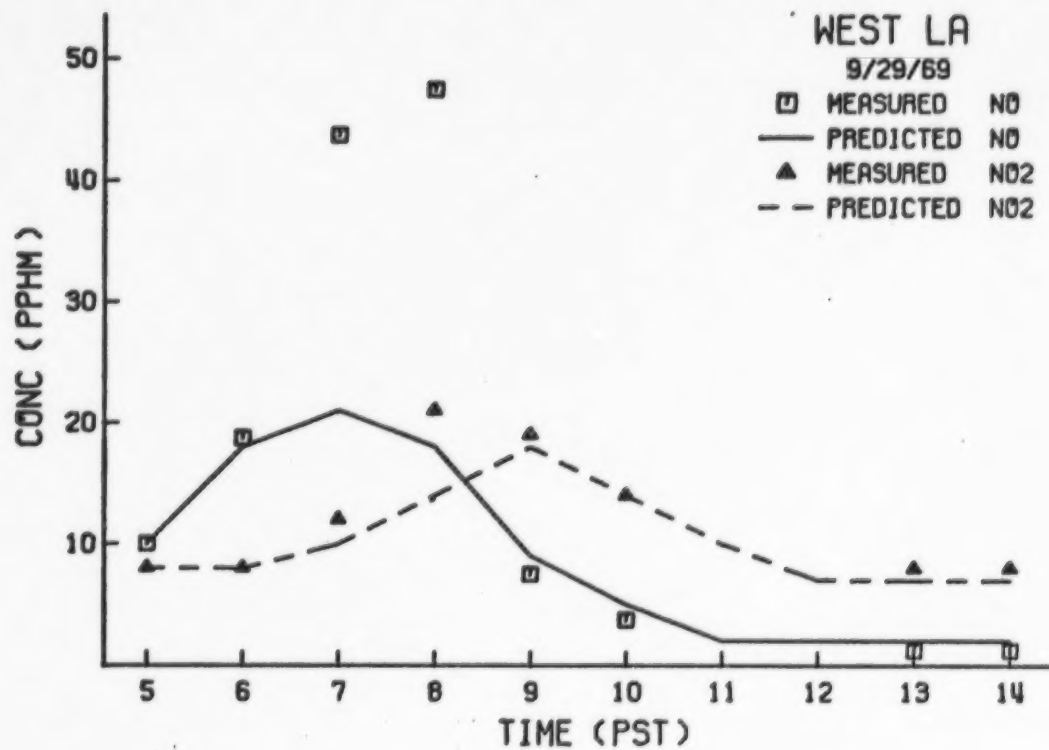
<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
SUPRES	--	Scalar	Number designating the absence of an air quality measurement at a particular time
SX	--	Scalar	x-direction scaling factor
SY	--	Scalar	y-direction scaling factor
SYN(I)	--	10	Alphanumeric array of integers SYN(I+1)='IIII' 0<I<9
T(I)	hour	12	Array of abscissa (time)
T1	2400 time	Scalar	Beginning of the time interval over which the model predictions were averaged.
TBOUND	--	Scalar	Value of y-ordinate at the top of the plotting area
TCORR(I)	hour	12	Array of abscissa (time) used for plotting the model predictions with local corrections added
TL	--	Scalar	Value of x-axis at the left hand edge of the plotting area
TR	--	Scalar	Same as TBOUND
TSTART	2400 time	Scalar	Simulation starting time
UNIT(L)	--	6	Alphanumeric designation of the concentration units for species L. (for example, 'PPHM' or 'PPM')
UNIT (LABEL)	--	Scalar	Alphanumeric designation of concentration units.

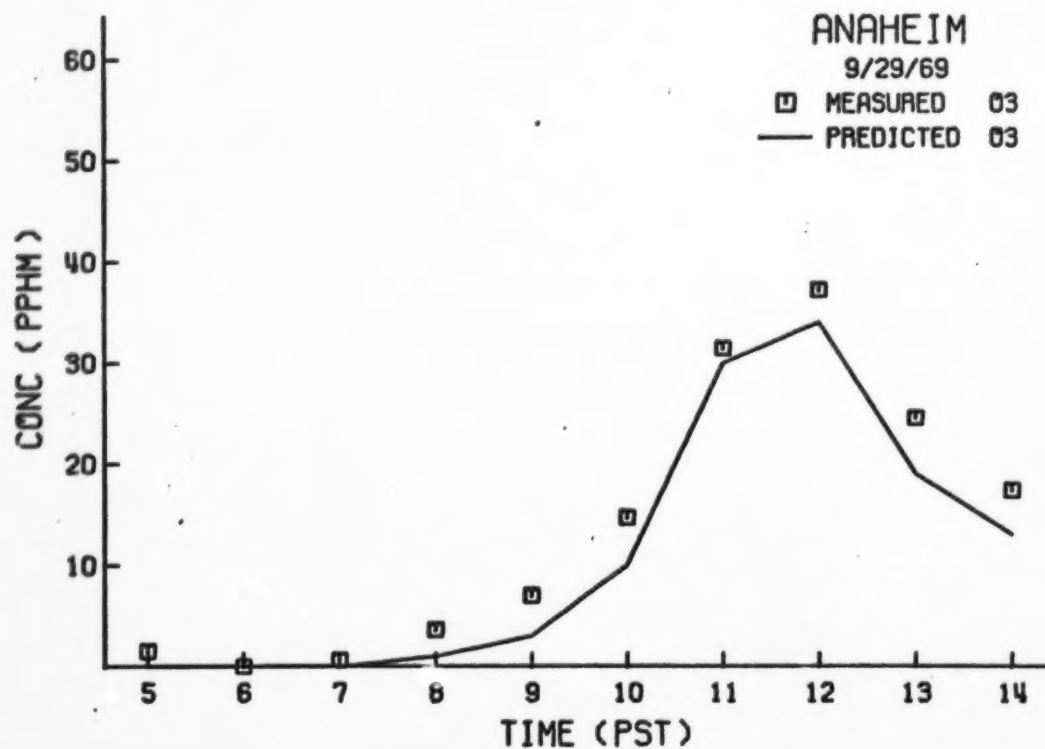
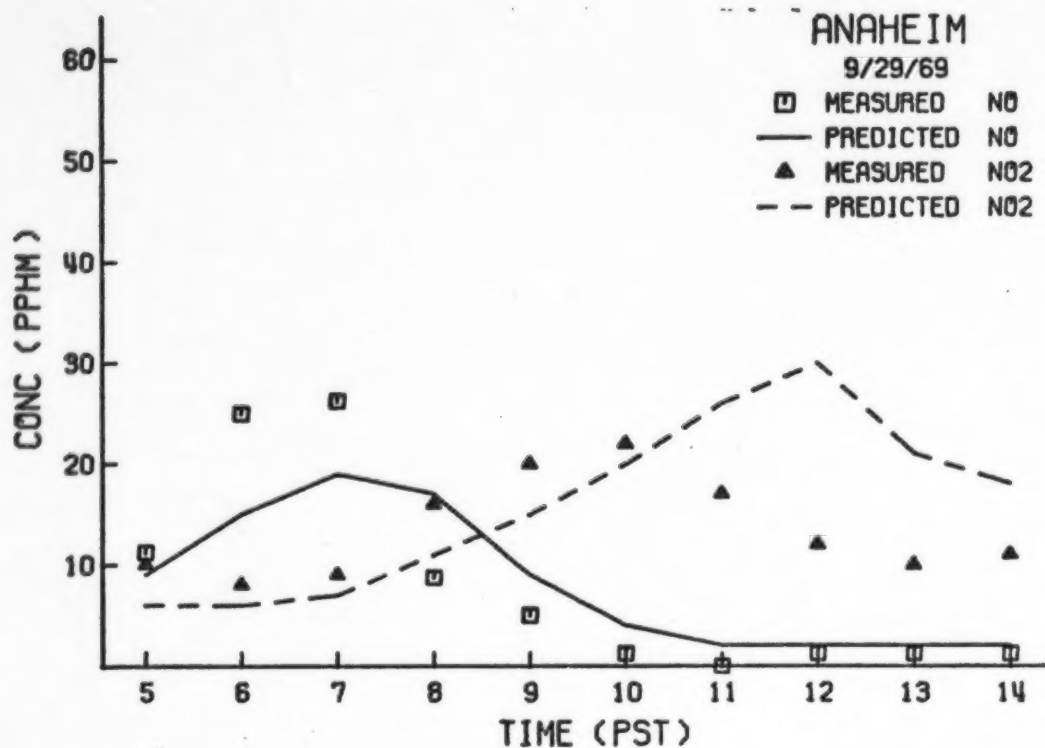
SYMBOL GLOSSARY (Cont'd)
DATA PLOTTING PROGRAM

<u>Variable</u>	<u>Units</u>	<u>Dimension</u>	<u>Description</u>
X	inches	Scalar	Distance from the left hand edge of the plotting area to the y-axis
X(I) (PLOTXY)	--	12	Array of abscissa
XDATA(I)	--	12	Array of abscissa
XPR	inch	Scalar	Distance between two adjacent tick marks on the x-axis
XLNGTH	inch	Scalar	Total length of plotting area in the x-direction
XPM	--	Scalar	Same as TL
IXI	--	Scalar	Same as TR
Y	inch	Scalar	Distance from the bottom edge of the plotting area to the x-axis
YPR	inch	Scalar	Distance between two adjacent tick marks on the y-axis
YLNGTH	inch	Scalar	Total width of the plotting area in the y-direction
YMAX	--	Scalar	Largest value to be represented on the y-axis
YPM	--	Scalar	Same as BBOUND
YMX	--	Scalar	Same as TBOUND









REFERENCES

Roth, P.M., Reynolds, S.D., Roberts, P.J.W., Seinfeld, J.H.,
Development of a Simulation Model for Estimating Ground
Level Concentrations of Photochemical Pollutants, Final
Report and 6 Appendices, Systems Applications, Inc.,
Beverly Hills, California (1971).